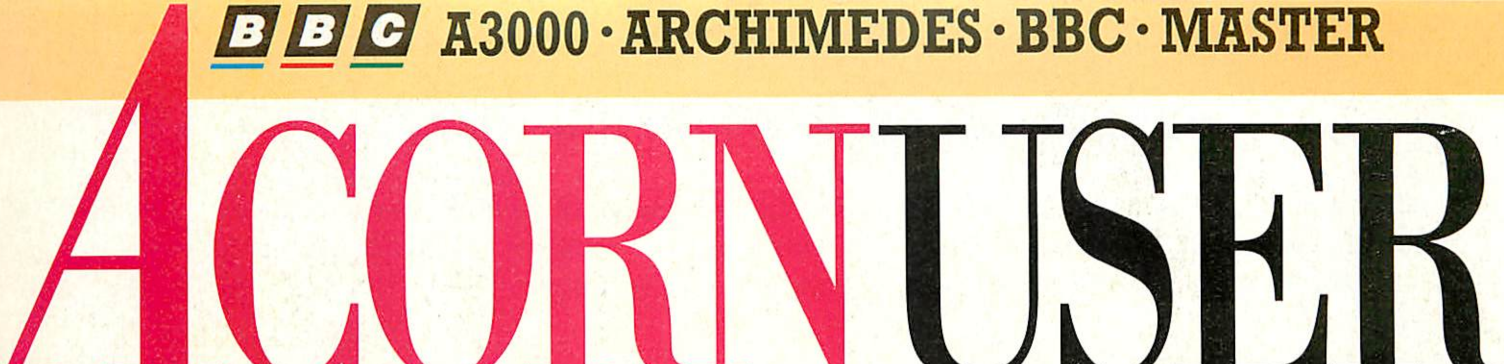


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Hard Drive Options From The Serial Port

We produce a range of hard drive upgrade options for the Archimedes range of computers. The controller card can be based either on the **SCSI** or **IDE** interface standards and drives come in many capacities for internal (300/400 series) or external connection. The hard drives used are high quality **Seagate** devices which are all fully guaranteed for one year.

SCSI is becoming the Archimedes 'standard' choice due to the range and number of devices you can connect to the interface - such as tape streamers, scanners, printers, CD-ROM drives etc as well as hard drives. Our SCSI package uses our **fast 8-bit interface podule** - also available as an **internal A3000 card** at no extra cost - and Acorn SCSI compatible software.

IDE is now the fastest selling drive standard in the world. It has two main advantages in that it is fast and is excellent value. We produce a **full 16-bit IDE interface** podule complete with all necessary software that allows it to be used in exactly the same way as all other filing systems such as SCSI, ADFS, RAMFS etc. For the A3000 we supply an external boxed version including the podule which has the advantage of leaving your internal slot free for other upgrades.

Example prices - for other drive capacities (up to 1352Mb) please contact us:

SCSI	**45Mb 28ms**	**Internal**	**£299**	**80Mb 24ms**	**Internal**	**£399**
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The Graphics Enhancer

£179 - including installation

The Graphics Enhancer adds a new dimension to the graphics capabilities of the Archimedes. Now you can use any 256 colours from a full 24-bit colour palette (16.7 million colours) in the desktop at resolutions up to 768 x 288 on a standard monitor and 832 x 328 on a multi-sync, as well as other modes such as 512 x 512 and 640 x 480 thus allowing, for instance, a true 256 grey scale to be obtained. Outside the desktop modes are available using up to 65536 colours. Multiple VIDC clock rates are software selectable and the interface can be controlled by a range of SWI calls and * commands.

For a full specification sheet please contact us.

"Frankly, I think the addition of such a board should be a very high priority. An upgrade equal to adding an ARM 3 board, and cheaper...The Serial Port promises us that the board will be something very special and I am inclined to agree. I think that the Graphics Enhancer will appeal to a massive Archimedes market." **Computer Shopper April 1991**

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All prices above exclude VAT. SCSI and IDE systems can be installed by us for an extra £25 - otherwise delivery is £10.



The *ideA* range of hard disc upgrades is being welcomed as the best way forward for Archimedes and A3000 users. "IDE is the small-computer drive standard for the future," says RISC User. "ST506 is on the way out; SCSI has only a limited future in the small drive market."

PERFORMANCE

IDE is the only true 16-bit hard disc system currently available for Archimedes computers. All data transfers are 16-bit all the way from the disc, through the interface, to the computer (except that the A3000 internal interface has an 8-bit link to the computer).

FLEXIBILITY

An *ideA* system can turn your A3000 into a 20, 40 or 60 Mb workstation with no external attachments, using hard discs which sleep quietly during periods of inactivity.

An *ideA* system can cater for two hard discs in the same internal or external housing, allowing you to build up your capacity in easy stages without wasting money.

Then there's the *ideA* 'hard card' option – a 2½-inch hard disc on a standard podule.

VALUE

We think *ideA* upgrades offer the best value for your money, and we aim to keep it that way. Advanced IDE disc technology means simpler, cheaper, more reliable interfaces. Manufacturers' prices for hard discs fall gradually, and we pass these savings on to you as soon as we can.

Our upgrade prices include everything you need.

RELIABILITY

The first *ideA* customers have been using the system successfully for over six months now. The A3000 internal hard disc is exceptionally reliable – not a single one has had to be returned to us.

The latest IDE discs are ruggedly designed with lap-top and portable computers in mind. You'll wait a long time to see a defect! A skilled service team is ready to back up our guarantee should the need ever arise.

COMPATIBILITY

The Micro User reported "no difficulty in running all fully RISC OS applications". Our IDE filing system is no different from ADFS in use, though it has a few extra features such as the facility to write-protect a hard disc. DOS partitions can be created for the PC Emulator.

CONTINUED SUPPORT

The next couple of years will see the introduction of many new IDE products, including tape streamers and removable discs. You may rest assured that our software and hardware will keep pace with these developments. Updates for existing users, if they ever become necessary, will be simple and cheap.

"A beautiful solution," said BBC Acorn User. Study our price list elsewhere in this magazine, and let us solve your storage problems too.

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DrawBender distorts Draw files to follow a shape of your choice. A useful addition or cheap alternative to Poster, supplied with these three decorative fonts.

DrawBender is simple to use, without any complex menu structures. The example above uses DrawBender with **FontFX** – the two make ideal companions.



Baildon Electronics Oddules open the way to cheap, flexible and almost unlimited external expansion via the I²C bus already supported by RISC OS. Baildon are producing a range of Oddules which may be daisy-chained.

Ready now is the ***AnDi*** Oddule. It has eight digital I/O channels with high current open collector drivers, four A/D inputs, and one D/A output. AnDi is capable of emulating user and joystick ports, allowing ADVAL operation from BASIC, and the use of Concept Keyboards and analogue or digital joysticks.

Cross-32 Meta-Assembler

This professional table-based cross-assembler works with over 50 target processors (including ARM2 and 3), and has been used for some time on PCs. A RISC OS Desktop version by Baildon Electronics is now available. Cross-32 is user-friendly and supports conditional assembly and macros. Output is in absolute binary, or Intel or Motorola Hex formats (ideal for eprom programmers and emulators).

You can modify the tables supplied or add new ones to cater for new processors and opcodes.



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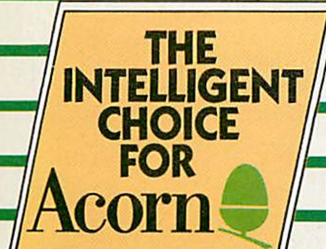
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RISC-COMPLIANT DATAKING READY

AIMED squarely at the A3000/ Archimedes in schools, *Dataking Plus* is said to offer a curriculum database solution.

Now available in Risc OS-compliant form, the new software is fully compatible with the original *Dataking* (released nine months ago), allowing schools with both systems to transfer files easily.

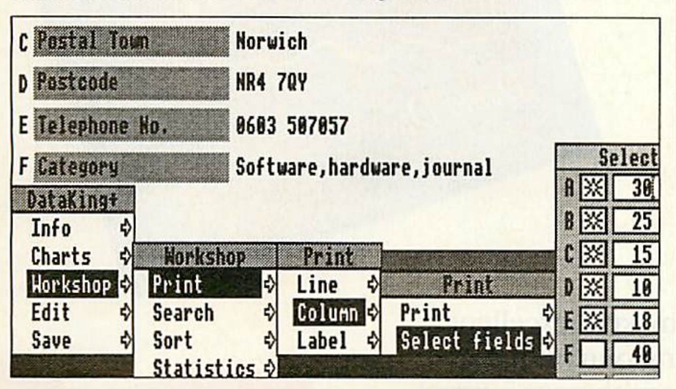
The facilities offered by the new package have been tailored to National Curriculum datahandling requirements.

File creation is simple and rapid, with no need to specify field type and length. The maximum number of fields is 31 and any field can be up to 230 characters.

Maximum file size is only limited by Ram available, but several thousand records can be handled on a 1Mb machine.

Data editing and entry is done by moving the required record and clicking on a 'tape recorder' icon, clicking the caret into the desired position and making your entry.

Dataking Plus costs £59, which allows use on any number of A3000s/Arcs within a school. Contact Shenley Software, 5 Coombefield Close, New Malden, Surrey KT3 5QF. Tel: 081-949 3235.



JUST THE BUSINESS

COMPUTER CONCEPTS has released a 'business supplement' to its *Impression* desktop publishing software, providing a new range of utilities aimed at the professional and business user.

Designed to supplement version 2.10 of the software, the new utilities include:

- File loaders for *Microsoft Word (RTF)*, *Wordperfect*, *Wordstar* and *Pipedream 3*, allowing files from these wordprocessors to be dropped directly into *Impression*.
- *ExpressionPS*, which simplifies the production of Postscript files suitable for typesetting.
- An extensive mail merge and record sorter, which allows simple multi-field records to be merged into *Impression* documents.
- The ability to output full four-colour separations from any *Impression* document, for producing quality colour leaflets, advertisements, etc.

The business supplement costs £57.57. Contact Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX.

ARC META ASSEMBLER

A NEW assembler for the Archimedes, the Cross-32 Meta, has just been introduced for the Archimedes.

Made by Baildon Electronics it uses a flexible instruction table structure, assembling programs written for microprocessors, microcontrollers and digital signal processors.

Cross-32 is user-friendly and produces output suitable for most integrated programming support environments. It can be driven both from the Risc OS desktop and within batch files.

The Cross-32 Meta Assembler costs £205 and is available from Ian Copestake Software, 10 Frost Drive, Wirral, Merseyside L61 4XL.

NEW DRIVER FROM BEEBUG

A RISC OS colour printer driver for the Star range of printers has just been launched by Beebug.

Designed for all Star nine and 24-pin colour printers (LC10 and 200, LC 24-200 and XB24-10), it is also suitable for most Epson compatible dot-matrix colour printers.

The driver supports various print resolutions and 'fancy' text printing. It costs £17.63 and is available from most Acorn dealers or direct from Beebug, 117 Hatfield Road, St Albans, Herts AL1 4JS. Tel: (0727) 40303.



NEWS IN BRIEF

- **ACORN** has reduced the cost of its memory upgrades for the BBC A3000 and Archimedes 400 series. Both types of 1Mb upgrade will cost £92, a saving of up to £80 on previous upgrade prices.

  For further information, contact Acorn on (0223) 245200.
- **APOLOGIES** for Iota Sotware's address 'falling off' the end of an item in last month's news. Anyone who wishes to enter bright ideas for using a database as part of a school activity should write to: Bright Ideas Competition, Iota Software Ltd, St John's Innovation Centre, Cowley Road, Cambridge CB4 4WF.
- **REGULAR** readers might have noticed that we have replaced our End User item, usually found on the back page, with a super cryptic puzzle. This will form part of a new 'fun' page in future issues, and we would like to hear your suggestions on what items you would like to see featured.

  Meanwhile, the concept behind End User – of finding interesting applications of Acorn computers – will continue in an expanded form in the magazine. Again, we would like to hear your ideas and suggestions – perhaps you have solved particular problems using an Arc or Beeb. If so, let us know.
- **NICK! NICK!** New Scotland Yard's Computer Crime Unit is being advised about Archimedes viruses by Clive Gringras and Warren Burch. Very few Arc viruses have been distributed so far due to the overall responsibility of owners and users.

  However, if you come across any problems, send details to: The Computer Crimes Unit, 2 Richbell Place, London WC1 8XD.
- **MULTIMEDIA** fans should consider a visit to the CD-Rom Europe '91 exhibition and conference, due to be held from May 21 to 23 at the Novotel, Hammersmith, London. A special education session will be held on May 22 and will examine the role of CD-Rom and multimedia in schools. For more details contact Angela Jones at Agestream Ltd on (0733) 60535.
- **IN LAST MONTH**'s advertisers' index, Computer Wize of Birmingham was listed as Computer Wize, Brighton. We would like to point out that the two are in no way connected and apologise for any confusion caused.



SPECIAL FEATURES LINED UP FOR ACORN USER SHOW

AS REVEALED last month, plans are well underway for the next *BBC Acorn User* Show, due to take place at the Wembley Conference Centre in London from Friday October 11 to Sunday October 13.

Acorn Computers will be there, along with over 60 other exhibitors from the Acorn marketplace. Companies who have confirmed their attendance include Watford Electronics, Beebug, Computer Concepts, Clares, Micro Supplies, Minerva Software, Colton Software, Pres, Lindis International and many more.

With the decade of the BBC micro fast approaching, there will be a chance to look at the development of computing from the first Beeb to the latest Archimedes.

Acorn is planning a series of 'consultative clinics', offering helpful information and advice in a number of areas, from education to business.

The games arcade will be running again this year, giving visitors the chance to try out the latest adventures.

A mock classroom will feature various groups working on different classroom projects using both BBCs and A3000s.

To support this, there are plans (which are yet to be confirmed) for a young programmers competition. This will be a great opportunity for school teams to create special programs with a specific theme related to the show.

A treasure trail competition will encourage visitors to gather information from the various exhibitors' stands and come up with answers to win a special prize.

A theatre is also being planned so that visitors can view on the big screen how certain programs work. There will also be helpful videos on a variety of topics.

Other special activity areas are also being planned, including a desktop publishing advice area featuring your favourite mag (*BAU*, of course!) being produced on an Archimedes DTP system.

The show looks like being a star-studded event, with a selection of star celebrities on hand to meet visitors.

For visitors interested in bringing along their families, a special children's creche is being organised. Family tickets, as well as travel packages, will also be arranged.

The opening times of the show will be 10am to 6pm on Friday and Saturday and 10am to 5pm on Sunday. Ticket prices and availablity will be announced in *BAU* as soon as details have been finalised.

All in all, a great show is planned. To make sure you don't miss it, put a note in your diary now and watch the news pages of *BAU* for further information.

DTP FOLIO AVAILABLE

ESM, the Cambridge-based educational software publisher, has announced the publication of *Desktop Folio* for the Archimedes.

The software has been through months of trials and development work.

Written by Chris Page, the package – which incorporates a wordprocessor and interactive publisher – is intended for use in both primary and secondary schools.

Pupils and teachers alike can use *Desktop Folio* to create lively stories with pictures imported from other Archimedes packages and design their own page layouts for essays, newsletters, and so on. Pages can also be linked together for interactive stories or worksheets.

Desktop Folio costs £105.75. Primary and secondary site licences are also available. For further information, contact ESM, Abbeygate House, East Road, Cambridge CB1 1DB. Tel: (0223) 65445.

EASY COPYING

IF YOU sell discs with your own programs on them, but are not happy about trusting duplication to an outside agency, then a new package from Norwich Computer Services may be for you.

The *Archimedes Auto-loading Disc Copier* can run from any Archimedes and enables you to do your own disc copying at a rate of 40 per hour.

The package consists of an auto loader (which takes 50 discs at a time), a 3.5in drive, an external disc interface, connection cables and software.

The auto-loader behaves as an external drive and the loading mechanism is controlled via an RS423 cable. It also allows you to develop the software further, eg, putting serial numbers on each disc.

The package costs £2750. Contact NCS on (0603) 766592 for further details.

POLES TAKE UP ARC DTP

A RECEPTION held recently for visiting Polish teachers at the West London Institute of Higher Education culminated in the group being presented with three Archimedes computers. The machines will be used to set up a desktop publishing system for the Polish Mathematics Association and enable them to keep in touch with UK software developments. The problem of the Polish alphabet has been solved by the enterprising Electronic Font Factory.

Pictured below is Dr Machiek Brynski (centre) of Warsaw University receiving the computers from Jan Potworowski (right) of the WLIHE and Dr Zbigniew Prochot (left) from the Polish Embassy.



BRIGHTER PROSPECTS

ACORN machines have been purchased by the first 20 higher educational establishments to order *Prospect*, the only comprehensive career guidance system for undergraduates in Europe.

Prospect consists of Unix-based software funded, at a cost of £2 million, by the Department of Education and Science in conjunction with private companies.

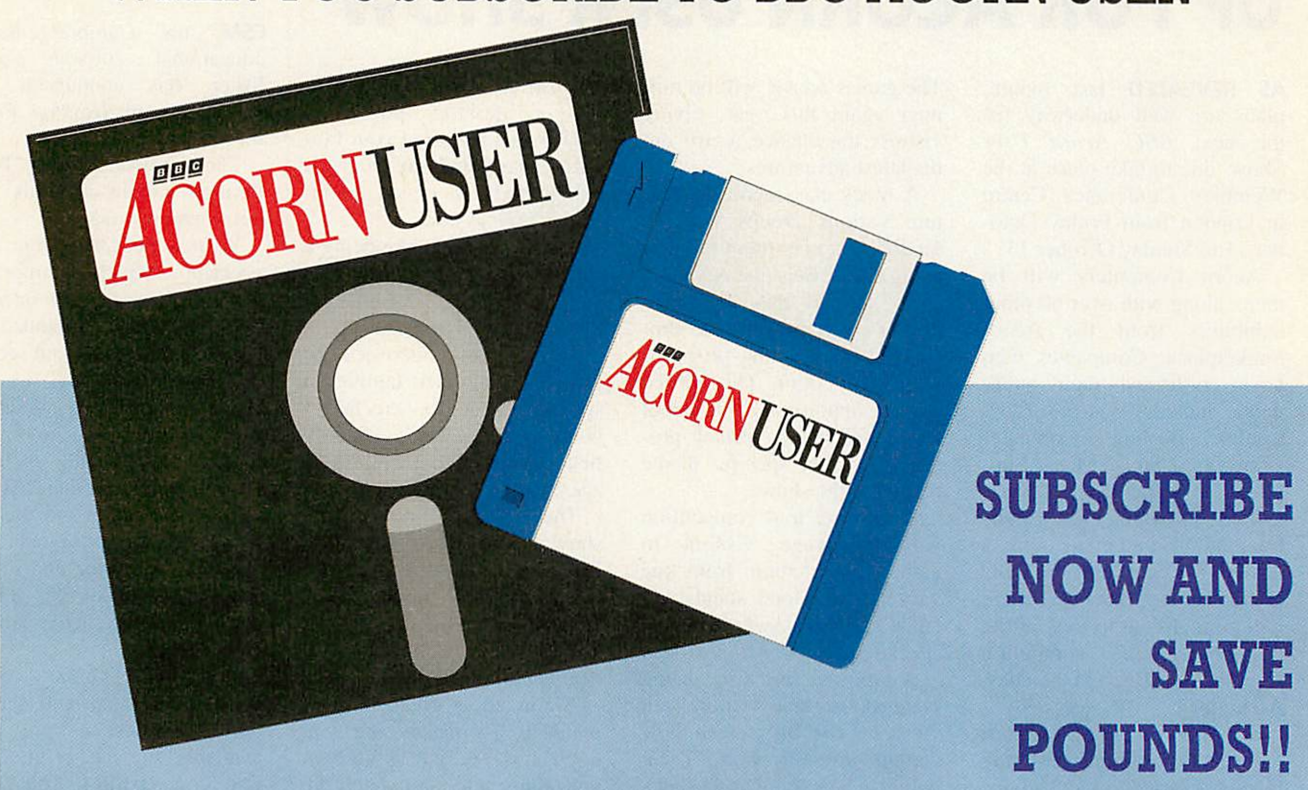
The software offers students careers counselling, including personal profiles which can then be matched against career opportunities.

A distributed version of *Prospect* – allowing several users from different locations to access it at the same time – has now been launched which can only run on Acorn's Unix workstations.

Contact Acorn Computers on (0223) 245200.

FREE MONTHLY DISCS

WHEN YOU SUBSCRIBE TO BBC ACORN USER



SUBSCRIBE NOW AND SAVE POUNDS!!

Every month, *BBC Acorn User* is packed full of useful features and programs for all the Acorn machines. That's why *BAU* is renowned as the leading magazine for Acorn computer users. Now, as an additional service to new subscribers we are offering *FREE* monthly discs with every 12-month subscription to the magazine.

THE MONTHLY DISC

Each monthly disc contains all of the programs listed on the yellow pages in each issue, so you can save yourself the time, frustration and effort of typing them in by subscribing today.

If you purchased each monthly disc separately, it would cost you up to £5.95 per disc. So, with a 12 month subscription to *BAU*, you could receive discs worth over £70 absolutely *FREE!*

COMPATIBILITY

The 3.5in disc is compatible with the A3000/Archimedes, BBC model B, BBC Master and Master Compact with 3.5in drive and ADFS.

The 5.25in disc is 40/80-track DFS and is suitable for use with BBC B/B+ and Master computers with a 5.25in, 40 or 80-track drive. So, no matter which Acorn machine you have, you can take advantage of this fabulous offer now.

WHAT DO I DO?

Simply fill in the coupon below and send it to:

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Or ring the credit card hotline number: **(0937) 842489**

NB: offer applies to UK subscriptions only, for details of overseas subscriptions see order form on page 96.



I would like to subscribe to *BBC Acorn User* for 12 months at the cost of £22.95 and receive my *FREE* monthly discs. (Discs are only sent from the beginning of a subscription period).

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ADDRESS...

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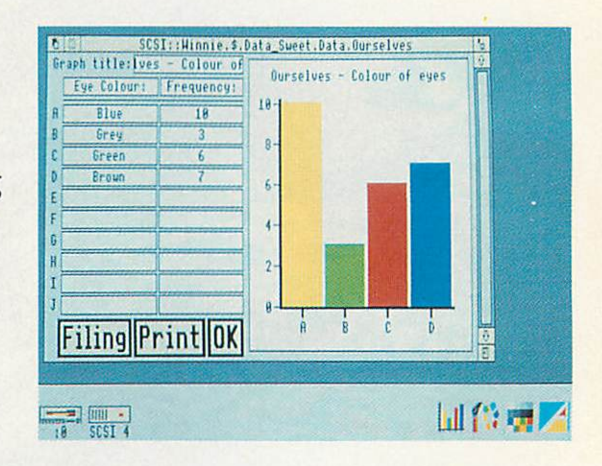
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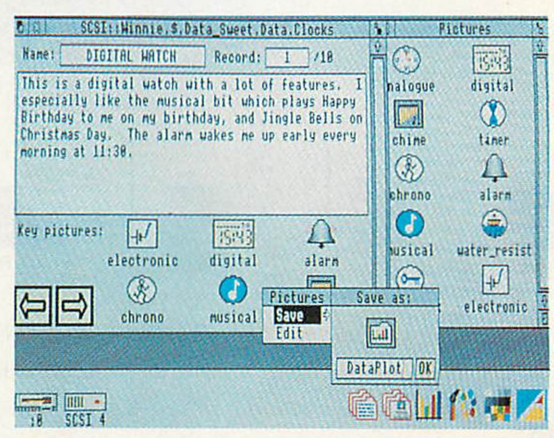
Card Number.. Expiry Date ....

DataSweet

DataSweet is a Risc OS desktop package especially written to develop children's data handling skills. Each application may be used progressively from basic graph drawing to full database searches and spreadsheet calculations. Each application has been written to facilitate delivery of the National Curriculum and its guidelines on data handling.

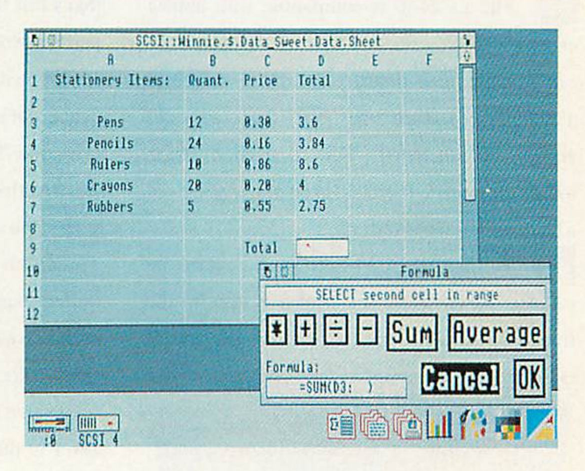


DataPlot is a simple to use graph drawing program, that integrates with the rest of the suite by importing data files created by other applications and displaying the information graphically.



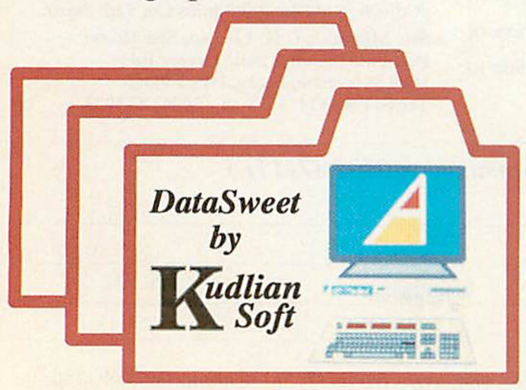
DataCard is a card index database that allows text to be entered into a free text field, with up to 6 keywords. The keywords can be searched on and exported to DataPlot.

DataPick is similar to DataCard, with the added feature of 'key pictures' instead of keywords. New pictures may be imported, by dragging into place from their windows.



DataFind is a more sophisticated database which introduces the concept of fields within records. Files created in DataCard may be imported into DataFind.

DataCalc is an introduction to using spreadsheets. Columns of data may be imported from all the other applications in the suite, and be exported to DataPlot to obtain graphs and charts.



For further information, contact: Hampshire Microtechnology Centre, Connaught Lane, Portsmouth, PO6 4SJ. Telephone: (0705) 378266
E-mail 01:YDO059

- *Single School Site Licence: Secondary £80, Primary £30*
- *Area/Group Site Licences: Secondary £30, Primary £6*



AND THE NOMINATIONS ARE...

THE EDUCATIONAL Technology Awards are again open for educationalists to nominate hardware, software or peripherals, launched in the UK in the last year, which they think worthy of an award.

In past awards, Acorn-related products have done very well. Last year's gold winner in the primary category was the Archimedes maths program *Connections*, from Sherston Software. The top secondary prize went to Economatics for *Control By Design*, its control technology pack for BBC micros. In previous years, companies such as 4Mation, Spacetech and Longman Logotron have picked up prizes.



BILL BONHAM FROM SHERSTON GETS LAST YEAR'S AWARD

The judges are looking for qualities like originality, flexibility, value for money and of course how a product can be used within the National Curriculum. They will make gold, silver and bronze awards in both age-groups.

To nominate a product you feel has made a significant contribution in your classroom, write its name and who makes it, plus your name and address and whether you are recommending it for primary or secondary use.

Send your nomination to The Educational Technology Awards, *Educational Computing and Technology*, 20-26 Brunswick Place, London N1 6DJ. You've got plenty of time as the closing date is 11 October 1991 but start thinking about possible contenders now.

Teachers nominating products which turn out to be eventual recipients of awards will, themselves, receive a certificate testifying to the soundness of their judgement.

WORLDLY LINKS

A national education programme, designed to help teachers deliver technology to five to 14-year-olds, has been launched by the Standing Conference on Schools' Science and Technology (SCSST). Under the umbrella title of Technology in Context, it aims to offer a wide range of opportunities for schools to forge industrial links in order to provide a curriculum closely related to the 'real world'.

As part of the programme, a series of classroom resources is to be produced, the first dealing with Control Technology. The pack, developed after extensive trials in Gloucestershire schools, comprises a short video, a pupils' activity book, a teachers' guide and a disc of software containing the control language Control IT.

Based around the industrial context of a factory, it looks at the technological processes used to make a variety of ice cream products. It also investigates how control and automation are used for stock control, security and monitoring the local environment.

The suggestions for project work, all closely tied to the Technology National Curriculum and the cross-curricular theme of economic and industrial understanding, centre on BBC micros.

The materials can be adapted for use in conjunction with any type of hardware, but the Acorn focus does make the pack particularly useful to schools with Beebs.

The approach to control technology is simple and straightforward and, although the pack was originally intended for lower secondary, primary schools will also be able to make good use of it.

Computer Control Technology costs £38.77 (including postage and packing) and can be obtained from SCSST, 76 Portland Place, London W1N 4AA. For information on other aspects of Technology in Context contact John Allum at the same address.

LOGOTRON ALIVE

Longman Logotron is weathering the recession well, reporting record sales for the first quarter of 1991.

The good results are apparently due to new programs for the Archimedes, notably *Pendown*, *Magpie* and *Revelation*, although well established products such as Logo are still selling well.

Looking forward to expansion, he said 'We have traditionally sold most of our product direct to schools; we are now seeing a lot of interest from Acorn dealers and other retailers. There are also new products in the pipeline.'

On a related matter, Longman Logotron's *Revelation* was two years in development at Homerton College, Cambridge and was the result of an NCET-funded project. This was not made clear in the March education column.

Lisa Hughes

NEWS IN BRIEF

● **ACCESS IT**, incorporating Acorn Networks, is an Acorn-sponsored and organised conference for all educationalists using the company's equipment. It takes place on 5 and 6 July at the Jesse Boot Centre, Nottingham University. The delegate fee is £350 although early bookers may be eligible for a reduced price of £117.50.

Special sessions include cross-curricular applications, hypermedia and multimedia and advanced network use.

For further information contact the Access IT Conference Administrator at Acorn, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN.

● **A COUPLE** of days later, a workshop on the use of microcomputers in science takes place at the University of Oxford Computer Teacher Centre.

The course, organised by a body called the Institute of Metals Software Subcommittee, will provide hands on experience with BBC micros. It is aimed at science teachers and advisers working in sixth form and tertiary education.

The dates are 7 to 9 July, the cost is £125, including bed and board, and KM Crennell, Rutherford Appleton Laboratory, Chilton, Didcot, OX11 0QX, has the details.

● **RECENT** releases from Cambridge International Software include a new version of Pipp (Professional Integrated Project Planner), the cross-curricular activity package for primary school teachers. A resource disc containing the framework for a project on homes is also available.

Mental Maths is an educational games program designed to test and improve pupils' mental arithmetic. Up to four players can participate and teachers can set the calculation complexity level.

All these programs run on the Archimedes. Pipp costs £51.05, the Homes project disc £16.95 and Mental Maths £20.40. CIS can be contacted at 8 Herbrand Street, London WC1N 1HZ.

● **FARMER GILES 2** is an update of another Archimedes primary maths package. It extends the original concept to provide addition, subtraction, multiplication and division games, all using Farmer Giles' flock of sheep.

Details from Computer Tutorial Services, 17 Market Hill, Cowes, Isle of Wight PO31 7TR.

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A3000	£599
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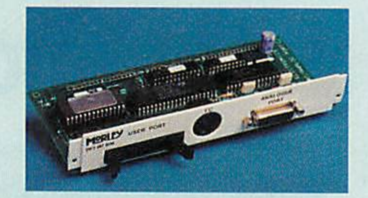
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Full specification BBC B analogue and user port. The analogue port is accessible using ADVAL from BASIC5 with all BBC OSbyte calls supported.



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305/310 2MB Expandable	£245
305/310 4MB	£375
305/310 2MB to 4MB	£150
400 Series 1MB	£50

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BBC/Master	£104
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Archimedes	£125
Optional PSU	£9.50

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Prices exclude V.A.T. and carriage.

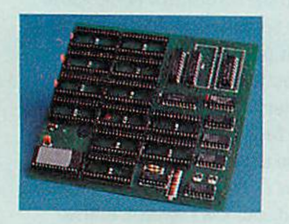
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Allows an additional 8x16k and 4x32k ROMS to be installed in the Master and still leaves the cartridge slots free.

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32K NON VOLATILE RAM Cartridge (ideal for Spellmaster Dictionary) £33

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A3000 SCSI Podule	£149
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Including SCSI podule, drive, cable & leads. A3000 drives also include drive case and switch mode power supply.

A3000 20MB	£399
A3000 40MB	£459
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Morley's SCSI and ST506 drives are among the fastest available. The podules are 16 bit and we only use fast, quality disk mechanisms. Phone for full details.

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ST506 DISK DRIVES

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A3000 20MB	£379
A3000 40MB	£459
A3000 55MB	£559
305/310 20MB	£299
305/310 40MB	£389
305/310 55MB	£474

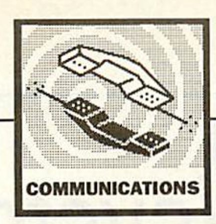
BBC / MASTER SCSI DRIVES



Completely compatible with BBC Bs, B+s and Masters fitted with ADFS. Free utility disc including Format, Verify, Archive and Park.

Interface only	£99
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ARCCOMM 2 ARRIVES!

BY THE TIME you read this, Peter Gaunt's long awaited sequel to *ArcComm* should be available from Longman Logotron. *ArcComm2* boasts a host of new features and looks set to offer healthy competition to The Serial Port's *Arcterm 7*.

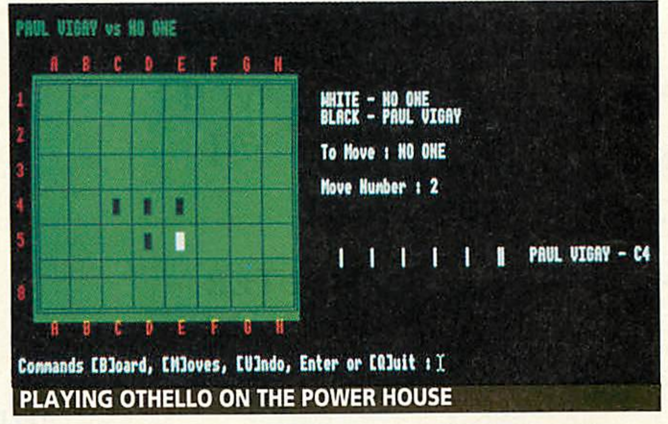
Not only does it include VT102, VT52, Ansi and teletype scrolling terminal emulations, but extensive viewdata facilities have also been included. These cope with Prestel, Teletel and Bildschirmtext systems and will be indispensible for European comms users.

Prestel Campus 2000 users are also able to switch terminals automatically when entering Prestel gateways.

The selection of file transfer protocols has also been expanded to include Xmodem-1K, Ymodem-batch and Zmodem in addition to the original Xmodem and CET. Although not quite as comprehensive as Hugo's 7Script, *ArcComm 2*'s script language has been much enhanced to allow you to up/download files and log on and log off from a script. Case-EndCase and While-Endwhile constructs have also been added.

One bonus for viewdata users is a built-in mailbox editor which allows you to work on a template of virtually any frame. An extra application also lets you prepare multi-frame MBX's off-line.

The price will be around £54, although there should be a discount for anyone upgrading from *ArcComm 1*. Longman Logotron can be contacted on (0904) 425444.



PLAYING OTHELLO ON THE POWER HOUSE

POWER HOUSE

There are now seemingly so many bulletin boards around the country, it can be a daunting task deciding which to log on to, and to know whether or not there will be something to interest you once you log on.

Every month or two I hope to describe a 'featured bulletin board' and describe its features and attractions. A sort of major plug if you like. This month I shall be taking a look at a BB in Cheshire. Run by Edward Hobson, the Power House differs from many Acorn orientated BBs in that it is not run on an Arc.

Instead, Edward is armed with an IBM PS/2 and 70Mb hard disc. Nonetheless, there are extensive Arc and Beeb sections, including echo mail and lots of downloads.

The echo mail areas cover virtually every area you could think of, ranging from hardware, programming and music to Bible talk, international cooking and education.

Download prototols include all popular transfer types including Zmodem and there are Archimedes areas including demos, general, tracker tunes and graphics.

A special chat option dedicated to Archimedes demos allows users to discuss and share ideas about the latest demos and anybody wishing to write their own demos may find some invaluable tips and advice here.

Among the non-computer specific areas are a gallery area and on-line games.

The gallery area allows users to send their own Ansi colour pictures for inclusion on a carousel of graphics. The on-line games are an impressive feature and are certain to run up large phone bills, so you'd better not get too addicted. You can choose from *Drag Racing*, *Tetris* and *Othello* among others. Each includes fully detailed Ansi graphics and looks good.

The Power House runs 24 hours a day on (0829) 782676 and supports Ansi colour graphics and all speeds up to 2400/2400 baud.

BOARDS ON THE BEEB

Eight-bit owners may have been feeling a bit out in the cold recently with all this talk of great Archimedes software and support.

However, the Beeb is far from dead in the comms world. In fact there are a great many bulletin boards running on Beebs around the country. Many have specific BBC chat, download and discussion areas, while many also have additional Special Interest Groups (SIGs). These are localised areas for people with similar hobbies or interests. They can range from anything from amateur radio to Ample and music. I hope to provide more details of these groups in future columns but for now, try the numbers in the box below. All are Viewdata/7E1 unless otherwise stated.

Don't forget, if you are running a bulletin board that you would like to see included, please write now and tell me.

Paul Vigay

Resolve	(0582) 832653
Cyclone	(0603) 260973
The Cellar	(0782) 551015
Raaulinebbit Run	(0924) 264170
Modem Mania	(0623) 861529
Connections	081-903 1309
Equinox	(0705) 871531
Procrastinet	(0584) 876012
DCT	(0384) 239944

NEWS IN BRIEF

● **ONE** previously untapped use of comms is shortly to be implemented by top Arc games producer, The Fourth Dimension.

Modem conversions of Chocks Away and the forthcoming Saloon Cars are planned, providing a way to link computers together via serial leads, networks or even modems. This will allow several games players to compete individually, each on their own computer without cluttered split screen displays. The Fourth Dimension is on (0742) 769950.

● **HAVE** you ever phoned up a large company and been left listening to (em...) soothing(?) music while waiting to speak to someone?

Well, now you can get your own 'music while you wait machine'. Storacall has produced a standalone unit for connection to the hold port of your PABX phone system. The cost of music to your ears is not cheap at £469. Storacall also produces Tamswitch – a switching unit that allows a single answering machine to connect to more than one phone line. Contact Storacall on (0242) 578815 for further details.

● **RTFM SOFTWARE** in Jersey has just announced a new modem, specially designed for use with the Archimedes. ArcModem is a fully Hayes compatible pocket sized modem that copes with CCITT v21, v22 and v22bis standards. It comes complete with drivers for Arcterm 6 and 7. Priced at £169, ArcModem comes with mains adapter, 9v battery and Arc lead. RTFM is on (0534) 67870.

● **A NEW** Beeb terminal package; Tetra, is about to be relaunched by Rudolf Cardinal. Costing a mere £10, Tetra gives Beeb owners a full Ansi emulation, including the full IBM character set, in addition to pop-up windows, telephone directory files, Xmodem file transfer, flexible screen width and full printer support.

Viewdata is also catered for, although no CET download option is included. Support is provided for users of either Hayes, demon-style or dumb modems and for user-to-user chat conversations, a split-screen mode is incorporated for clarity of use. If you require more details, Rudolf can be contacted via Semaj BBs on (0303) 862415 (scrolling, BN1).

DOS GETS OUTLINE FONTS

COMING from the Archimedes to the PC, one obvious difference is the former's consistent font system. From the outset, Acorn designed a coherent system which should be the envy of most other computer manufacturers.

It uses scaleable fonts, generates them automatically on screen and printer, maintains the standard across all well-written applications and includes 'hints' as standard.

The PC has a long history, dating back to around the same time as the original BBC micro. During the many stages of development, fonts have been added in a piecemeal fashion by third party software houses. Most of these companies have had their own ideas of how fonts should be handled, where they should be stored and who should do the translation from the original 'hot metal' typefaces.

The first important standard didn't apply to the PC's screen at all. When Hewlett Packard introduced the Laserjet printer, it offered a number of typefaces, some internal to the machine, others available in plug-in cartridges.

Although some applications – wordprocessors and spreadsheets in the main – supported these font systems, it was only on the printer; the PC screen still displayed the Rom-based monospaced fonts it had always done.

The next step was for the same type of fonts available in cartridges to be made available as disc files and downloaded to the printer as needed.

These 'soft fonts' gave rise to software which could create equivalent screen representations. Each font was therefore stored in two versions, printer and screen, with a separate file for each point size required.

This system is still the most commonly used today and products such as Bitstream *Fontware*, GST *Typographica* and the print manufacturer Monotype all provide font sets in this format. Monotype provides a set of the most common sizes predefined on the disc. The other two provide their own font generator, which lets the user select and create the sizes and styles needed for a particular application. This is more flexible, but both variants can take up a lot of disc space.



EXPRESS PUBLISHER 2'S VECTOR FONTS LOOK GOOD

Since the advent of Windows 3, true scaleable fonts have become available from companies like Adobe, Bitstream and Zenographics.

These systems create screen and printer fonts 'on the fly', as they are called for. Adobe's *Type Manager* can create fonts which have Postscript-compatible character widths and need only store an outline of each face, rather than the bitmaps in each size and style.

Scaleable fonts are definitely in the ascendent. Power Up's excellent *Express Publisher 2*, for instance, includes its own scaleable font system. It shares its outlines with other products from the same stable, too.

Nonetheless, there is still some way to go before the PC offers the system-wide font compatibility of Risc OS.

ACORN TO PC

Those working between the Acorn ADFS and Microsoft's MS-Dos (or the IBM equivalent, PC-Dos) can run into understandable confusion.

Although some parts of the operating systems are similar, there are others different enough to cause problems. In Dr John Lockley's new book, *Acorn to PC*, he describes both systems, the differences between them and ways of getting over the transition.

The book is divided into 27 short sections covering many aspects of the two systems. It concentrates on the operating systems, which will be most users' approach to the underlying hardware.

The text is suitable for BBC micro, Master and Archimedes users, though it is perhaps geared more towards the transition from BBC/Master to PC than to the user of an emulator. There's no mention of the MS-Dos workalikes Dos Plus or DR-Dos, for instance.

The book is clearly written, with plenty of easy-to-understand examples.

Lockley has a style which handles the technical nature of much of the material without the 'blinding with science' often found in American computer books. His background in broadcasting obviously stands him in good stead.

Acorn to PC is published by Watford Electronics, tel: (0923) 37774 and it costs £15.95. This may seem pretty expensive, but there's a lot in its 260 pages that may prove money well spent.

All you need to do is read just the single warning on page 69 and you could save valuable time and money.

Lockley points out that the simple command DEL. file1 under MS-Dos will delete all files in the current directory, not just file1. This is because MS-Dos treats '.' as an abbreviation for '*.*'!

Simon Williams

NEWS IN BRIEF

● **WHILE** on about abbreviations (see review of Acorn to PC), the command DIR *. will normally display all the sub-directories of the current directory, but none of the files. This assumes that all your files have filetypes and none of your directories do. It relies on the fact that sub-directory names are stored in the same way as filenames, but without filetypes.

● **ONE** of the most innovative small software houses in this country must be Clockwork Software. The company has produced a number of excellent utilities for the PC, among them a batch file compiler, memory-resident text editor and four voice pianola. Its latest brainchild is two related programs, sold together, called Bookmaker and Helpmaker. As the names suggest, these programs display a book or help system on the screen. Write your latest program's documentation as a text file and let Helpmaker turn it into a context-sensitive help system. The program costs £58.75 and Clockwork is on (0705) 483217.

● **IF YOU USE** PC or Acorn drawing/painting programs with a mouse attached to your BBC, Master or Archimedes, you could well find a use for Tracey. This is a simple add-on for a mouse in the form of a transparent lens with etched cross-hairs. With it, you can trace line drawings or high-contrast photos and use the tracing as the basis for a complete drawing. Tracey costs £7.95, from Sidewise, PO Box 4, Totnes, Devon TQ9 7EN.

● **THE MS-DOS** command XCOPY is useful when you want to copy a set of files already saved in a set sub-directory structure on a disc. DR-Dos extends this facility to the XDEL and XDIR commands as well. By typing XDEL *.OLD /S, for instance, you can delete all files with the .OLD filetype in the current directory and in any sub-directories leading off the current one. The /S switch works with the XDIR command too, showing all specified files in the current directory and those below.

The XDIR command has some other useful switches, as well. /C, for example, computes a hash code for each file, rather like a checksum. These codes can be used for comparing the contents of two files. Finally, you can sort the display by filename or date and in forward or reverse order.

NEXT MONTH

BBC ACORN USER

GAME CORE

An exciting program for the Archimedes which allows you to design a number of different games from one core. Find out how it works and try some games programming yourself

TOUCHTYPE

If you have difficulty getting your typing up to speed, new software from Iota could solve your problem

COMMS SERIES

After giving you a basic introduction to the fascinating world of communications, we delve into more detail on what you can expect to find on-line

VIEW PREVIEWER

For users of the Beeb's most popular wordprocessor, we have a simple program that allows you to preview special effects, such as bold, on screen

Watch out for the June issue of BAU – available May 9 1991

PLUS

FIRST STEPS

Our series on using the BBC A3000 continues with advice on creating simple documents

UPGRADING THE A3000

The first of a special two-parter showing you how to expand the memory of your A3000

MY WORLD

We review an educational package which lets children create customised diaries

PIECES OF EIGHT

Another delve into the *BAU* archives for more classic programs for the Beeb

REGULARS

- All the latest news and views from the Acorn world
- A new helpful advice and ideas section covering A3000/Archimedes and Beeb
- Your letters and problems
- Programs galore on the yellow pages and much more

To be sure of your copy, please fill in the coupon below and hand it to your newsagent. Or why not subscribe? See page 10

TO THE NEWSAGENT
DEAR NEWSAGENT, PLEASE ORDER MY REGULAR COPY OF BBC ACORN USER

YOUR NAME ______________________

ADDRESS ______________________

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BBC Acorn User is published by Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ. Distributed by BBC Frontline, Park House, 117 Park Road, Peterborough.

Genesis II

Puts Creative Power Firmly in Your Hands

Genesis II, the new release of Oak Solutions' market leading multi-media package, Genesis, is widely acclaimed as the most versatile piece of software ever written for the Archimedes. Genesis II is effectively an information manager, and the built-in script language allows powerful RISC OS multi-tasking applications to be written by those with only limited programming abilities, indeed, RISC OS desktop applications can be written without even touching the keyboard!

Genesis II offers all the features of the original, but also offers a massive increase in functionality. Advanced data compression techniques ensure that applications take up much less space on disc. New linking tools allow a wide range of events to trigger new pages to open, including single mouse clicks, double clicks and even 'timer' events.

Multiple text styles and colours are now available within a single frame. Text may be left, right or fully justified, or centred, and can be printed out at DTP quality. The new 'Button' filetype allows predefined features and actions to be simply dragged onto a page which greatly speeds the creation of new pages of information and also ensures a consistent look and feel to your pages.

Genesis II is an ideal development tool for creating multi-media applications using CD ROM drives and Video Disc player technologies. It can be linked to sound samplers and video digitisers, and can be used in conjunction with a Genlock card for video titling.

With its enhanced interfacing capabilities, Genesis II can now be controlled by the Concept Keyboard to broaden its uses in the important fields of Primary and Special Needs.

For all multi-media applications on the Archimedes, Genesis II offers a fully functioned, versatile and easy to use system. Genesis I applications will run without modification.

To qualify for upgrades, please return your original Genesis 'Editor' disc to Oak Solutions at the address below.

Upgrade price £52.00 RRP   Genesis II £130.00 RRP

Please add £1.00 to cover P&P.   Prices exclude VAT

Telephone for Education and Volume Discount Prices.



Oak Solutions Cross Park House Low Green Rawdon Leeds LS19 6HA Tel: 0532 502615 Fax: 0532 506868



SOUNDS BAD

I've been running the Acorn music processor *Maestro* and have created various files. Unfortunaly I have found the sound level abysmally low, with the sound being drowned out by the hard disc! Can you help me before I give up electronic music for good!

Danny Fagandini
London

The Archimedes has a sound quality that simply cannot be duplicated though the internal speaker (or speakers with the A3000). There is however a 3.5mm stereo jack on the back of your Archimedes which you can plug a pair of headphones into. You could also connect this to a stereo amplifier to hear how good the sound really is.

If you have the Philips monitor, which is usually supplied as part of the standard Arc 310 package, you could also use the amplifer built into this. You only have to connect it up to the Arc sound output via a lead with the 3.5mm jack.

HAND CONTROL

A number of years ago a single hand keyboard was produced and I believe you had an article aout it. If I remember correctly the right hand was placed on the keyboard, which consisted of five keys, and the text was taken down in a subsitute for shorthand.

William Marshall
Conventry

The Quinkey, by Micro Writer, is what you are looking for. You can't get it any more (at least we don't think so) but maybe a reader has one spare?

DTP AT SCHOOL

We have an Archimedes running *Impression* and want to investigate what we would need to produce a good quality school magazine. At present printed copy (from *Interword* on the Beeb) is sent to the printers. I presume they retype this (although this year I supplied an MS-Dos text file). They then send us galley proofs which we cut and paste and then include art work with information about size reduction or enlargement etc. We then send back this paste-up, and eventually a plate proof comes back, and final changes can be made, at a price. Then the printers print the magazine. The whole episode costs us in the region of £3500 – £4000.

It occurs to me that we may be able to do much of the work ourselves, saving the school a large sum of money, though at first we may have to invest in a 600dpi laser (we already have Calligraph's Arc laser).

Can you advise me on what we need. I suspect dealing with text would be straightforward but artwork and photographs may be more difficult. It would be nice to be able to do eveything but the final printing here at school and have the finished job back fairly quickly, exactly as we wanted it.

Tim Hoddle
Northhampton

The Archimedes is a very capable DTP machine, as we prove each month by producing the magazine on it, and you definitely do not need to have the page make up done by the typesetter. Some typesetters will now accept a Postscript file on an MS-Dos disc from which film can be made for the presses. The Postscript file is produced with the Postscript printer driver on the applications disc set to print to a file. This file can then be dragged onto an MS-Dos disc, using *PC-Access*, *Multi-FS* or another similar application, and the disc given to the typesetter who will produce the film.

Of course if you do it this way, you have to ensure the fonts you use are all Postscript compatible (the Electronic Font Foundry sells many such fonts). Pictures can be scanned in but a typesetter will produce much better quality scans.

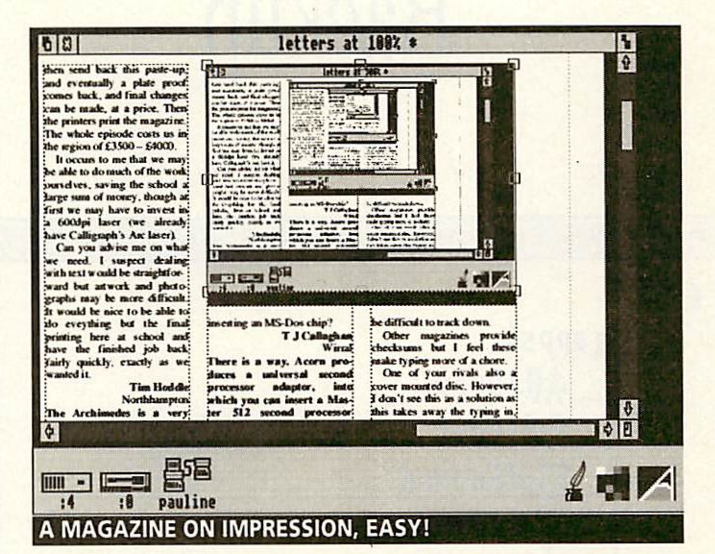
Watch out for a special feature in *BAU* coming soon about how the magazine is bought to you every month.

DOS MODIFICATION

I have a BBC model B. Is there any way of modifying this so that I can run MS-Dos software on it? Is it as easy as inserting an MS-Dos chip?

T J Callaghan
Wirral

There is a way. Acorn produces a universal second processor adaptor, into which you can insert a Master 512 second processor board, which Acorn has stopped producing but you should be able to get second-hand (can any reader help?) Then your BBC will be able to run most CGA-based PC applications.



A MAGAZINE ON IMPRESSION, EASY!

SMALL PRINT

Ever since I started to read *BBC Acorn User* I have enjoyed typing in the listings on the yellow pages. It may sound strange but I find the frustrating, hair tearing, nerve grinding experience rather pleasing, even satisfying. And when I finish typing and have my working program it's all worth it.

My eyesight isn't what it used to be (too much time in front of the monitor probably!) and I very often make mistakes with l's and i's, zeros and O's. The circumflex (^) is impossible to distinguish from a tilde (~). And this leads me onto my question, why are the listings so small?

I can see your problem with Arc applications, particularly good ones like *PicList*, which can be extremely long. Desktop applications are also far more difficult to type in and debug – you might not recognise an error for quite some time and when you do, it can be difficult to track down.

Other magazines provide checksums but I feel these make typing more of a chore.

One of your rivals also a cover mounted disc. However, I don't see this as a solution as this takes away the typing in, which I so much enjoy (it also teaches me far more about programming than any manual). The only solution I see is to make the listings bigger, so how about it?

B Hunt
Enfield

The yellow pages have been a unique part of *BAU* for some time, and we would only discontinue them if most readers did not find them useful – which is why we asked you about them in last month's reader survey. Of course, increasing the size of the print means allocating more pages to the listings, at the expense of other features or reviews. We would like to hear more opinions on the subject from readers – so let us know what you think.

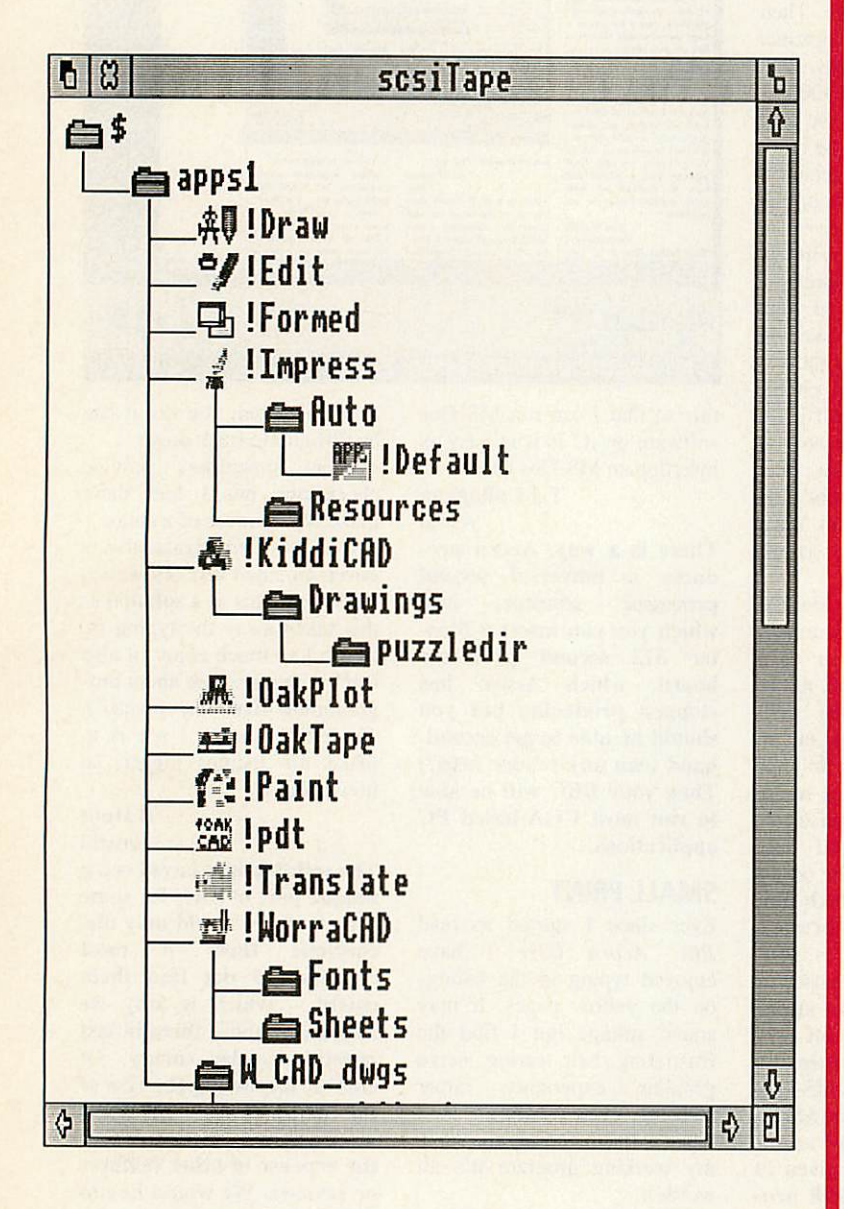
BBC PD?

Do you know of any good eight-bit public domain companies? It occurs to me that the 32-bit people are getting all the limelight when it is perfectly feasible for us eight-bitters to take advantage of this new fad as well.

E Maguire
Notting Hill

Keep an eye on the software showcase for developments in BBC PD.

Hard Disc & Network Backup





We've Got It Taped

Cross Park House, Low Green, Rawdon, Leeds LS19 6HA

For professional backup of data under Risc OS, Oak Solutions' tape backup systems provide the ideal answer to all your problems.

All our tape backup systems include !OakTape, our comprehensive and widely acclaimed Risc OS backup software. Backups are done on a file-by-file basis with versatile control over backup criteria. Automatic backups may be triggered at pre-determined times, and printouts of tape contents can be automatically generated. Restoring from tape is simple and intuitive. Files and directories can simply be dragged from a tree viewer, or directory viewers, either to disc, network or even directly into an application!

The cassette-based CS range offers the cost effective answer to backup from Econet, or where budgets are tight. The DC600 cartridge-based TS range offers increased speed performance over the CS range, and for the ultimate in capacity and reliability, the Elite streamer gives 1Gb of storage on Digital Audio Tape (DAT) media with an astounding error rate of 1 bit in 10^{15}.

Naturally, the entire range is manufactured under our 'zero defect' regime, so the highest quality and reliability are ensured.

CS20SC	20Mb	695.00
CS60SC	60Mb	895.00
CS150SC	150Mb	1095.00
TS60SC	60Mb	1099.95
TS150SC	150Mb	1354.00
TSGIGA	1Gb	3095.00



QUESTIONS AND ANSWERS

Q Why did I buy a BBC A3000? I find it very difficult to use! I need a simple book or two to get me going. What can you recommend?

K V Meader
London

A **I am sorry you are experiencing such difficulties with your BBC A3000, but don't give up!**

From January this year we started our own series called First Steps with a BBC A3000. Have you tried that?

I am sure you will find the following guides helpful too. They are both beginners books on using the Archimedes and BBC A3000 and I feel sure they will assist you.

Archimedes First Steps **by Anne Rooney published by Dabs Press costing £9.95.**

!Help – A Teacher's Companion to the Archimedes and A3000 **by David Eccles, published by Sherston Software costing £7.95.**

Q I am certain that I am never going to master a mouse enough to enable me to control my recently purchased BBC A3000. I have pressed my BBC model B keyboard for years and now find that the mouse is a lot of trouble. The pushing and pulling it around the mouse mat is more difficult than I thought. Are there any alternatives?

T Winn
Southend

A **If you are using the BBC A3000 desktop I'm afraid you have got to use the mouse or some other pointing device. Watford Electronics markets alternatives like a Trackerball which you may find easier as you roll the ball, rather than move the mouse around. It will cost you about £30.**

Q In the school office we have recently moved the typewriter out and started using the *View* wordprocessor with the BBC Master Compact we purchased for a song! We now want to computerise our class lists and put an end to typed lists that are continually altered throughout the year as pupils come and go. Can you help us find a suitable database to use with this new computer under the ADFS filing system?

We want to build up a card index-type database with approximately 550 records. What do you recommend?

Tony Healy
Malahide

A **I think that the best product for your work is the** ***System Delta*** **data handling system developed by Minerva Software in Exeter. The package consists of a Rom and software on disc. The database is fully programmable but comes with a card index-type application that uses a mask for entry. Minerva also markets a package based on** ***System Delta*** **called** ***School Administrator*** **which may be more suitable for your school.**

Can I suggest that you contact the company direct and discuss the suitability of its BBC products for your work. When you order, you will have to specify that the product is for use with the ADFS filing system.

Q What's the possibility of sharing various items like disc drives, monitor, and printer between a BBC A3000 and IBM PC-286? What would be the cost of the extra kit I would need to assist in the sharing process?

K Graham
Kendall

A **You could certainly share a printer between the computer systems. Printer sharer boxes which enable you to switch between computers are available. I suggest you contact either Technomatic or Care Electronics. I imagine the cost will be between £20 and £45.**

It is also possible to use a colour monitor suitable for use with an IBM PC and the BBC A3000 or Archimedes. I recommend you consider a multisync monitor manufactured by Taxan, Eizo or Samsung. They cost between £350 and £500.

It is important that the monitor is purchased from an Acorn dealer as there can be slight technical issues concerning the use of these monitors on Acorn equipment and they will be able to ensure the computer and monitor is matched

I am not aware of any Acorn related company that markets a monitor switcher box. But VGA switcher boxes will be available from the larger PC dealers. If not, maybe Care Electronics will make one up for you. A cable for connection to the IBM PC will be supplied in the box and any Acorn dealer will sell you the necessary cable for the connection to the A3000.

Do remember that many of the A3000's screen modes are not VGA or EGA standard and that some modes are only appropriate for certain types of monitors.

Companies like Watford Electronics, Beebug or CJE Micros manufacture interfaces to allow you to connect 5.25inch drives to the BBC A3000. These cost around £35. Similar products are

---

If you have a particular problem with an Acorn micro, commercial software or a program you are trying to write yourself, then BBC Acorn User might be able to help. The BAU Post A Problem service guarantees to give you a personal answer to your problem within 10 working days – and for just £4.

Write out your problem with as much detail as possible and, if a program is involved, include a disc or cassette. Fill in the coupon and send it and your problem along with a cheque or postal order for £4 (including VAT) made out to Redwood Publishing. If you require recorded delivery, please add the cost of this.

Please note that debugging readers' own programs or those from other magazines is a complex task and we cannot guarantee to give a full solution. Unless the problem can be spotted quickly, the Post A Problem service will only be able to make general comments.

The Post A Problem service will answer the problem and return all corresponding material received within 10 working days of receipt. If we fail to match this promise then your cheque or postal order will be returned – you just can't lose!

BBC Acorn User Reader Service
20-26 Brunswick Place, London, N1 6DJ

Name...

Address...

....

....

Daytime phone number...

I enclose a cheque/postal order for £4 made out to Redwood Publishing and an SAE with my problem.

Office use only : Date in...........Date Out...........Reference...........

available for PC connection, these usually include the drive too and cost about £75. I am not aware of any switching devices that would enable disc drives to be shared between a PC and a BBC A3000, however Watford Electronics did market a product that allowed BBC micros to share disc drives and it may be able to make up a sharer device to meet your needs.

Q I know my Mannesman Tally MT180 dot-matrix printer could be considered old but I would like to use it effectively with *Draw* and the secondhand Archimedes 310 I've just purchased. Unfortunately I have experienced problems in the use of the MT180 when using the Acorn printer driver *PrinterDM*.

However when I used Colton's *Pipedream* I was able to use the supplied FX printer driver with no problem. What is causing my problem?

Charles McIver
Bedfordshire

A The Acorn *PrinterDM* driver was developed for newer nine and 24-pin printers that were compatible with the Epson FX and LQ series of printer.

I believe your printer is broadly compatible with the older Epson MX range, which has different graphics commands and capabilities.

It may be possible for you to change the data contained within *PrinterDM* so that many of the facilities of the MT180 will work.

You will need to load the file PrData into *Edit* and alter it by adding another printer to the end of the list.

Increase by one the number of printers and then copy a block of printer information from one of the printers listed and make alterations to sections with reference to your manual.

Q I am looking for detailed lists of educational software that may be suitable for use with the Beeb. Are there any such lists?

D Jooster
Salisbury

A Although you don't specify what age groups you are interested in, I think you may find the following publications useful:

***Educational Software Directory for the BBC Micro* published by Rickitt Educational Media, Ilton, Ilminster, Somerset.**

***The Educational Software Catalogue for the BBC, Nimbus, IBM PC and Archimedes* published by AVP, School Hill Centre, Chepstow, Gwent NP6 5PH.**

Also, look out for *Educational Computing and Technology*. This will provide you with details of recent software releases and articles on curriculum development. For subscriptions, tel: (0937) 842489.

Q At present I use an old TV set with the secondhand BBC micro I bought last year. I'm rather pleased with the way I can use my 'new' system for wordprocessing but I find the TV set is not the best sort of screen. I would very much like to drive a green screen monitor with my BBC rather than use a TV set. Is it possible to do this?

D J Luke
Salisbury

A It is quite possible to drive a green screen monitor from a BBC micro. Phillips markets a range of suitable green or amber screens which cost about £60.

Connecting it up should be no problem either as most models are suitable.

The monitor should be connected to the socket marked <VIDEO OUT> at the back of your BBC micro. This is near the socket marked <UHF OUT> which is normally used for obtaining a picture through a TV set.

The <VIDEO OUT> socket expects connection via a BNC connector so you will have to ensure that the lead you have or purchase has this connector.

You could try Care Electronics of 800 St Albans Road, Garston, Watford, Herts WD2 6N (tel: (0923) 672102). You will be able to get a suitable lead there.

ACORN CUSTOMER HOTLINE

Risc OS is composed of many separate sections called 'relocatable modules'. Many of the modules are in the Risc OS Rom, but some have been updated. Newer versions are often supplied with applications, and can also be obtained from SID or via your usual Acorn dealer.

It is important to distinguish between a module version number and an application version number. Applications have an Info item on their menu to give the version information. Your modules can be checked by pressing F12 to access the command line and then typing *Help Modules. The modules you have installed in your machine are listed with their numbers.

You can install all the modules in your System folder before checking by opening it (hold down SHIFT and double-click Select on the mouse), then opening the Modules folder. Now double-click on each module.

If the module number listed after *Help Modules is less than the one listed here then it is out of date.

● Latest Acorn Modules:

Colours	0.52
FPEmulator	2.80
!65Host	1.40
NetFS	5.40
NetPrint	5.30
NetFiler	0.24
NetStatus	2.01
HourGlass	2.02
Sound2	1.13
IRQUtils	0.09
WimpUtils	0.04

To obtain a copy of the latest Risc OS Extras disc, which contains these modules, send a cheque for £19.95 made payable to Acorn Direct, 13 Dennington Road, Wellington, Northants NN8 2RL. Alternatively you can get the 'disc' from SID if you have a modem, or from your dealer.

Release two Printer Drivers can again be obtained from SID or your local dealer:

PrinterDM	2.46
Printerlx	2.46
PrinterLJ	2.44
PrinterPS	2.44

A new module for use with these drivers is also supplied on the Printer Driver disc:

MsgTrans	0.06

People who have purchased any of the DTP packages on the market will have been provided with the outline font modules:

FontManager	2.44
SuperSample	0.06
FontControl	0.12

FontControl is actually an application which allows you to control various aspects of the outline font system – the Fontmax commands and the font cache.

In most cases, new versions of these modules can be obtained through your dealer, who has access to SID. If you didn't buy through a dealer then a dealer list can be obtained by calling Acorn on (0223) 245200 and asking for the Customer Support department.

When you have your new versions, you can delete the old ones in your System.Modules directory and replace them with the new ones. An application called SysMerge is provided with the new printer drivers to help you do this.

● A floppy disc can only hold 800K worth of data. This can be a problem when you have more than about six families of fonts: you can't get more fonts on a disc. But you can keep fonts in different directories on different discs. For example you could call one !Fonts and another !MoreFonts.

There is a way of setting up the !Run files in your various font directories so that when your Arc needs to load a font it will ask you for the disc with it on. This is achieved by altering the !Run file in your main Fonts directory so that it includes the lines:

```
Set Font$Prefix <Obey$Dir>
SetMacro Font$Path <Font$Prefix>.
```

MoreFonts can have the same !Boot and !Sprites files as Fonts (use Paint to change the name of the sprite in the !Sprites file to !Morefonts). The !Run file can be like the one in Fonts, but replace the two lines above with the line:

```
Set Font$Prefix Obey$Dir>.,<Font$Prefix>
```

The dots and commas are vital.

Now double-clicking on the MoreFonts directory will add fonts to the fontlist. Double-clicking on your main Fonts directory goes back to your 'core set' of fonts. The machine will always ask you for the other disc when it needs a font from Morefonts.



RISC REVUE

£20 WOOF BAA!

It's always nice when readers continue a theme from a previous Risc Revue. Such is the case with our opening program from **Bryan Creer** of Poole. He saw Jonathan Lynch's flocking program in the December 1990 issue and has extended the idea to model the behaviour of larger (and indeed woollier) creatures. His program is listing 1 on the yellow pages.

The original flocking program picked up on a current fad to represent the behaviour of groups of animals on the computer. The idea was to create a population of birds (or fish) which flock towards the mouse pointer. Bryan realised that to model a flock of sheep would require a more complex set of rules.

In this case, the pointer acts as a sheepdog and so the sheep naturally veer away from it. However, a compensating force is required to stop them fleeing across the hills and out of sight. Bryan thus gave each sheep two possible states – 'grazing', in which the sheep isn't too worried about anything and is quite content to just wander about munching grass, and 'herding', where it is trying to keep out of the way of the sheepdog and hide among its neighbours.

Looking at the program, the number of sheep is held in n%. Each sheep has a position held in the arrays x() and y(), a direction held in d%() and a 'herding' counter herding%(). These are randomised at the start. If the herding counter is zero, the sheep is assumed to be grazing and its behaviour is determined by PROCgrazing. In this state, the sheep happily wanders around, bouncing off the edges of the screen and other sheep.

FEELING SHEEPISH? TRY LISTING 1

However, sheep may be put into 'herding' mode (by setting the herding counter to a non-zero value) by two possible causes. If a grazing sheep stumbles upon the sheepdog by chance it will take fright and try to hide behind its nearest neighbour. Alternatively, if the sheepdog moves (reflected in the variable dogmoving%) then all sheep within a radius of 200 will move towards their nearest companion, even if it's minding its own business and chewing the cud.

When herding, sheep move at a speed inversely proportional to the distance from the dog (a fair bet in sheep psychology terms). To improve the model yet further, very close sheep are ignored so small groups head off towards other collections and individuals. Another nice touch in Bryan's simulation is revealed when all the sheep are together in a single herd. In this case they move much more slowly having more collective courage.

Once the dog has moved away, the herding counter is decremented and when it reaches zero the sheep can go back to grazing. It can take a little while for a sheep to settle down after a chase.

If you'd like to experiment, try changing the critical distances used in PROCmodify_sheep or increase the number of sheep. An Arm 3 machine should comfortably cope with 20 or so. Happy herding!

RANDOM CODING

The RND() function in Basic is a useful device when writing anything where you'd like an element of chance introduced. Generating random numbers in machine code may appear daunting to the novice programmer but in fact it's one of the easiest things you can do in Arm assembler.

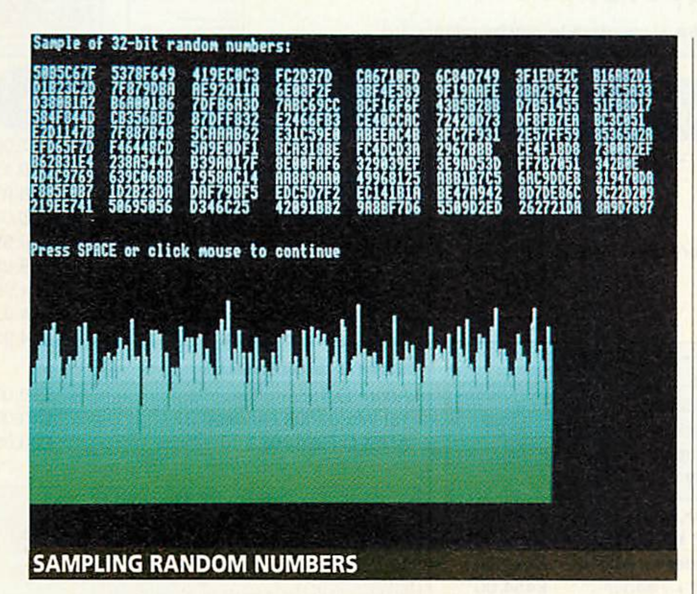
The term 'random number' is often prefixed with 'pseudo' in computer manuals and this is because the numbers generated are not truly random.

The idea is to use a sequence of numbers which repeats itself only after a very long time indeed.

Although the theory behind such a sequence is not that simple, the sequence itself can easily be generated in machine code (or indeed Basic). Listing 2 shows the way.

This program generates a random bitstream – a series of zeros and ones of a suitably random nature. You simply start off with a seed (set to TIME for even more randomness). This is shifted left by one bit. If the bit shifted out was one then the seed must be EORed with a special value (stored at .xor). The state of the carry is effectively random and in listing 2 this is used to return either zero or one in register R0.

Listing 3 shows how larger random numbers are built up. For 32-bit values we simply do the 'shift and EOR' 32 times. This could be done in a loop, although because each iteration only requires two instructions it is not costly in memory terms to assemble them in full. This saves a lot of time if you



SAMPLING RANDOM NUMBERS

use random numbers a lot. To illustrate the output, a sample is printed and then a table built up for random numbers in the range 0-255. These are achieved by simply using only the bottom eight bits of the 32-bit number returned by rand. The results are plotted to give a visual indication of their randomness.

It is often necessary to get random numbers in a less friendly range. Ideally you should where possible set up variables that require values that are powers of two. For example, if a plane flies into your game at a random speed, time will be saved if this speed is in the range 100-355 say. In this case you could assemble a generator with eight iterations, grab the bottom eight bits of the seed and add it to 100.

If you really do require numbers from a peculiar range, there are two quick cheats you can use without having to resort to machine-code division routines.

The first is shown by listing 4 and is simply a 'try-again' principle. Random angles are generated (in the range 0-359 degrees) to illustrate a typically awkward range.

The program works by calculating random numbers in the range 0-511 and, if the result is not less than 360, another is got instead. If the range is close to a power of 2 this method can be quite efficient. It does have the drawback that occasionally it will take a lot of attempts to get a number in the correct range and it is not always desirable to have a routine that takes an unknown amount of time.

Listing 5 also produces random angles but does so with a crafty technique much favoured by *BAU* regular Dave Lawrence. If you are dividing x by y where both x and y are suitably small it is much quicker to multiply x by 1/y instead. In this case we take the random number in the range 0-511 and multiply it by (360/512)*&10000.

The &10000 provides us with some accuracy. Finally we shift the result down again. This procedure takes less time than the try-again method and of course is a little more predictable. I should say that the programs given are for demonstration purposes only and could be speeded up considerably by optimum use of registers and so on. I hope they illustrate the point though.

£15 CLEVER ATOMS

Another RR update comes from **Laurie Howe** of Romford. He's provided a computer-thinking routine for Adrian St John's *Atoms* game from the April 1991 issue. The extra lines you need to add to the original are given as listing 6. Type them in ensuring that the new and original line numbers are correct.

When you start the game you will be asked whether each player is computer or human. So it's possible to have six computer players battling it out at once.

The thinking routine is quite simple, calculating for each possible square a weight based upon how close the square and its neighbours are to reacting. Even so, the computer plays a very good game and is difficult to beat. PROCcom does the work – building the table of weights and then finding the best. FNadd is used to add in the weight of adjacent squares that might react and become converted to the player's colour.

For extra effect, the new lines of listing 6 also highlight the square of an exploding atom and produce a little bang!

£5 ODD GASKET

R G Taylor of Handsworth in Birmingham sent in listing 7 saying he has no idea how it works. Neither have I. If you run it you'll see a result that will be familiar if you've been reading *BAU* over the last few months. Incidentally, for the program to work you'll need to have at least 20K of sprite workspace handy.

£5 FILECORE FIX

There is a dreadful beast, rarely mentioned for fear it might be woken up, that lurks in some dark corner of your machine waiting for you to create your ultimate masterpiece. Only then will it strike and, just as you are about to save your magnum opus, the error message 'FileCore in use' appears and you're up the creek without a filing system (as it were).

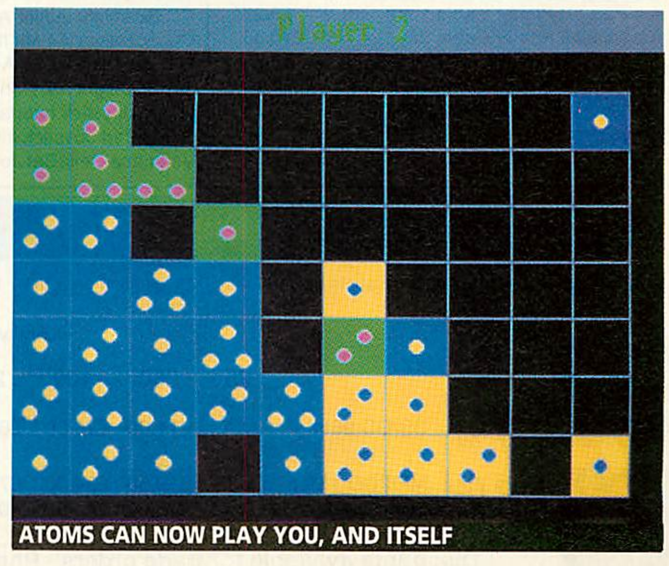
If you haven't experienced this error, you can prepare yourself with a valuable tip from **Derek Dawson** of Inverurie. Should the dreaded message appear, press F12 to get the * prompt (if in the desktop) and type:

```
RMReinit ADFS
RMReinit Filer Desktop
```

After this you can at least save your masterpiece, although it is wise to reset the machine at the earliest opportunity. The 'FileCore in use' error occurs because the FileCore module (which is at the heart of the ADFS and other filing systems) is trying to prevent itself being re-entered. That is, the module was used to perform some filing-system operation and before it had finished, was asked to do something else. It's not clear why the 'in use' error occurs from time to time, but it's as well to be prepared!

THAT'S ALL FOLKS

Well, like Eight Bits, this is the last time you'll see Risc Revue. From next month, both sections will appear in a new combined form, compiled by myself, Dave Acton, and Dave Lawrence. Please continue to send your submissions to BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ.



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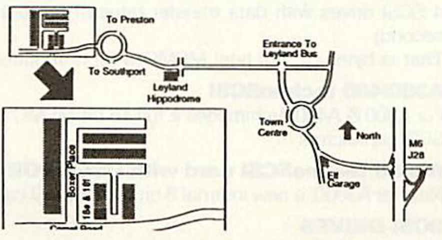
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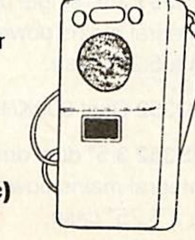
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technoSCSI card with external 105 MB Drive	£899(a)
technoSCSI card with external 313 MB Drive	£1999(a)

TRACKER BALL

A sturdy, high quality tracker ball is now available to replace the Archimedes mouse. You will no longer run off your mouse mat and at the same time you can save valuable desk space. The tracker ball is fully compatible with the Arc mouse driver. **£30(c)**



A3000 UPGRADES

1Mb £56(c) 3MB	£169(c)
AEDA external floppy drive adapter	£30(c)
External 5.25" 40/80 floppy drive	£90(b)
Hard Drives & Controllers	
Cased techno HD Controller	£175(b)
External ST506 drives are cased with mains PSU.	
20 Mb 40ms Cased, PSU & Cables	£249(a)
40 Mb 25ms Autoparking, cased	£359(a)
50Mb 28ms (as A440/1), cased	£449(a)
For 300/400 please state drive 4 or drive 5	
SCSI Drives & Controller	
Internal 8 bit technoSCSI card & USER PORT	£179(b)
technoSCSI card with external 40 MB Drive	£399(a)
technoSCSI card with external 105 MB Drive	£899(a)
Acorn MIDI/User Port	£49(b)
MultiPod Video Digitiser/Sound Sampler	£145(b)
technoSCAN II Hand held Scanner	£175(a)
Wild Vision Chroma 220	£155(b)
Tracker Ball – new low price	£30(c)
technoTablet (needs serial upgrade)	£209(a)
Stylus for tablet	£15(d)
Serial Port Upgrade Kit	£19(c)
A3000 Technical Manual	£29(c)

ARCHIMEDES MODEM PACK

Miracom WS4000 + lead and ARC Comm Software Modem Pack **£129(b)**
Serial upgrade required with A3000

SPECIAL DISC PRICES

3M 3.5" DSDD Discs
Box of eleven **£6.50(d)**

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Ian Copestake Software

- No carriage charges on UK cash orders
- Up-to-date stock – no obsolete versions
- Credit cards not debited until orders fulfilled

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1st May 1991

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Overseas Add £6 (Europe) or £12 (elsewhere) for each software item if paying by pounds sterling bank draft payable in England, or Eurocheques *not exceeding £100 each*. If you are paying by credit card we will add airmail and insurance at cost. (Add £10 + 1% of the total price if you can only pay in your own currency).

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All products, prices and specifications are offered in good faith and are subject to change without notice. Your order will receive our attention immediately, but suppliers sometimes keep us waiting.

Goods are guaranteed but we do not supply them on approval.

ABBREVIATIONS

Ace	Ace	Col	Colton	Min	Minerva
Aco	Acorn	ComT	Computer Tutorial	Oak	Oak
Apr	Apricote	Dat	Data Store	Pana	Panasonic
Arm	Armadillo	Dig	Digital Services	Pand	Pandora
Arn	Arnor	Emr	EMR	Pil	David Pilling
Arx	Arxe	Gra	Graphics Factory	Ser	Serial Port
Ato	Atomwide	Hum	Human-Computer	Sil	Silicon Vision
Aut	Autodesk	ICS	Ian Copestake	Sim	Simtron
Bai	Baildon Electronics	Ife	IFEL	Spa	Spacetech
Bee	Beebug	Iot	Iota	Sta	Star
Cal	Calligraph	Irl	Irlam	Sup	Superior Software
Can	Canon	Kad	Kador	Tec	TechSoft
CC	ComputerConcepts	Lin	Lingenuity	4ma	4Mation
Cha	Chalksoft	Lon	Longman Logotron	4th	Fourth Dimension
Cir	Circle	MicP	Micro Power	D	Draw format
Cit	Citizen	MicS	Micro Studio	P	Paint format
Cla	Clares	Mid	Midnight Graphics	✓	On special offer!
		Mit	Mitre		

BBC / MASTER / ELECTRON SOFTWARE

BET Basic Editor and Toolkit		
– rom module	ICS	£19
– rom in cartridge	ICS	£25
Powerfont NTQ	ICS	£13
Spellmaster rom	CC	£52
Wordpower	ICS	£36
– site licence (extra)		£100
– extra rom		£7
– extra manual		ᵛ⁰£7

ARCHIMEDES SOFTWARE

If it's not on the list, please ask for a quote. We will always try to match the best prices.

ABC Basic Compiler	Oak	£77
Accounts	Min	£243
ANSI C Release 3	Aco	£125
Apocalypse	4th	£22
Archway (now in stock)	Sim	£78
ArcLight	Ace	£40
ARC-PCB	Sil	£139
– Professional	Sil	£276
Armadeus	Cla	£59
Artisan II	Cla	£44
Artisan Gallery	Cla	£16
Atelier	Min	£67
Autosketch CAD	Aut	£69
Charts & Graphs	ComT	£17
Chess 3D	MicP	£18
Children's Graphics D P	MicS	£16
Chocks Away	4th	£19
– Extra Missions		£15
Clip Art P	Gra	£19
Clip Art D	Mid	£28
Colour Screen»Mac	Hum	£90
– Arc/Mac Cable		£24
Craftshop 1	4ma	£28
– network version		£34
Craftshop 2	4ma	£28
– network version		£34
Cross-32 Meta-Assembler	Bai	£175
DataVision	Sil	£114
Decorated Alphabet P	MicS	£17
Designer Intro	Tec	£75
Desktop Enhancer	Mit	£26
Desktop Office	Min	£96
Desktop Publisher	Aco	£112
Disc Tree	Mit	£37
DrawBender + Fonts	ICS	£12
– site licence		£50
Drop Ship	4th	£15
DTP Graphics 1 (Mono)	MicS	£15
DTP Graphics 2 (Colour)	MicS	£17
DTP Seeds	4ma	ᵛ⁰£8
Easiword	Min	£31
EQUASOR ✓	CC	**£41**
E-Type	4th	£15
Euclid 2	Ace	£52
Expression-PS	CC	£19
Film-Maker	Sil	£75
Financial Accountant	Sil	£204
First Words and Pictures	Cha	£19
FLEXIFILE ✓	Min	**£101**
Flying Start II	Mit	£86
FontFX	Dat	£9
– site licence (total)		£70
Font Pack	Aco	
– Newhall / Starter / Symbol	each	£41
Font Pack	Bee	
– 1 (already included with Ovation): Paladin, Swiss B, SymbolB, Vogue		£43
– 2: Bookman, Chancery, Courier, Garamond		£POA
– 3: Dingbats, New Century Schoolbook, Optima, Times		£POA
Font Pack	CC	
– Avant Garde / Bookman / Pembroke	each	£29
Fortran 77 Release 2	Aco	£82
Fourier Analysis	Arm	£60
Gammaplot	Min	£52
Gate Array Design/Teaching	Sil	£114
Genesis II	Oak	£114
– education price		£99
GerberPlot	Sil	£92
GraphBox	Min	£61
Hard Disc Companion	Bee	£35
Hearsay	Bee	£51
History Costume P	MicS	£17
Holed Out	4th	£15
Hotlink Presenter	Lin	£43
House of Numbers	Cha	£19
Hyperbook Reader	Lon	£47
Hyperbook Electronic Library (including Reader)	Lon	£109
IMPRESSION 2.1 ✓	CC	**£126**
– network version		£650
– site licence		£545
– extra hardware key for sites		£15
– extra manual for sites		ᵛ⁰£8
IMPRESSION JUNIOR ✓	CC	**£68**
– site licence		£435
– extra manual for sites		ᵛ⁰£7
Inertia	4th	£15
Inspiration	Pand	£POA
Interdictor 2	Cla	£27
Investigator 2	Ser	£23
ISO C Devt System	Bee	£77
Jiglet	4ma	£26
Jigsaw	4ma	£28
Keyboard Player	Cha	£17
Knowledge Organiser	Cla	£47
Letters and Pictures	Cha	£17
Logo	Lon	£55
Magpie	Lon	£47
Maps and Landscapes 1	Cha	£19
Maps and Landscapes 2	Cha	£19
Mark Master	Cha	£67
Mogul	Ace	£18
Movaword	Cha	£17
MultiFS	Arx	£28
Multistore	Min	£197
– site licence (total)		£1250
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Note Invaders	Cha	£17
Numbers and Pictures	Cha	£17
Numerator	Lon	£65
Numerator Chaos	Lon	£18
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Olympics	4th	£15
Orrery	Spa	£92
OVATION ✓	Bee	**£75**
Payroll	Min	£129
Pendown	Lon	£50
– Extra Outline Fonts	Lon	£18
Personal Accounts	Apr	£23
PipeDream 3	Col	£118
Pirate	Cha	£17
Poster	4ma	£79
Powerband	4th	£19
Prehistoric Animals P	MicS	£16
Premier	Cir	£71
– DataBase	Cir	£25
– WordProc	Cir	£25
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Presenter II	Lin	£36
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– Epson / Star / Citizen colour		£13
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Professional PDT CAD	Oak	£353
Protext	Arn	£117
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Puncman 3 and 4	Cha	£17
Puncman 5 to 7	Cha	£17
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Revelation	Lon	£68
Reversals	Cha	£17
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RiscForth Compiler	Sil	£114
RISC OS Companion Vol 1	Oak	£49
RISC OS Programmer's Reference Manual	Aco	ᵛ⁰£75
RISC OS Style Guide	Aco	ᵛ⁰£11
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SQUIRREL ✓	Dig	**£102**
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Toolkit Plus	Cla	£37
Tools Graphics D	MicS	£24
Touch Type	Iot	£41
Tracer	Mid	£48
Tween	Ace	£25
TWO (Task and Window Organiser)	ICS	£19
– site licence		£60
Utility Disc 1	Dat	£13
Utility Disc 2	Dat	£13
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– Arc/Mac Cable		£24
Wimp Game	4th	£15
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– site licence (extra)		£100
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World Geography Maps D	MicS	£24
World Wildlife P	MicS	£16
1st Word Plus	Aco	£68

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Bubble Jet BJ-10e	Can	£276
– Sheet feeder		£54
Bubble Jet BJ-300	Can	£455
Bubble Jet BJ-330	Can	£535
KX-P1123	Pana	£199
KX-P1124	Pana	£226
– 32k ram for KX-P1123 / 4		£20
KX-P1624	Pana	£369
Laser Direct Qume	CC	£856
Laser Direct LBP-4 Card	CC	£309
Laser Direct LBP-8 8 ppm 600 dpi including toner	CC	£1340
LBP-4 4 ppm	Can	£750
LC24-10 32k ram card	Sta	£61
Swift 24 Colour	Cit	£279
Rebuilt Canon Toner cartridge		£45
Archimedes parallel printer cable		£8

FUNCTION KEY STRIP ORGANISER

Arckey	ICS	ᵛ⁰£3
– quantity of 4		ᵛ⁰£10

MEMORY, ARM3 ETC

Fitting extra unless stated
† Fitting is straightforward
‡ Fitting requires expertise

A3000 2Mb †	Ife	£69
A3000 4Mb †	Ife	£243
A310 2Mb ‡	Ife	£215
– as above including fitting		£259
A310 4Mb †	Ife	£POA
– as above including fitting		£POA
8Mb A400/1 / A440 / R140	Ato	£699
ARM3		£400
4-slot 4-layer Backplane	Ife	£57

ideA

HARD DISC PRODUCTS

☆ LOWER PRICES!
☆ NEW ADDITIONS!

The number at the end of a product name is the capacity in megabytes. An L indicates a 1 inch high disc: two of these may be fitted in the same cradle or external case, sharing the same controller card. An S indicates a 2½ inch wide disc mounted directly on the controller card.

Our 'upgrades' are fully guaranteed and include the ideA controller card, a fan (where needed), and everything else you will require. A backplane is optional on the A310, but if you do use one it must be a four-layer type.

A300/400/500 series internal upgrade

IDEARCIN20S	23ms ☆	£475
IDEARCIN40	28ms ☆	£289
IDEARCIN40L	25ms ☆	£329
IDEARCIN80L	19ms	£449
IDEARCIN120L	19ms ☆	£599
IDEARCIN200	15ms ☆	£879

A300/400/500 series external upgrade

(May also be fitted to A3000 external expansion slot using a podule case or racking system)

IDEARCEX40	28ms	£429
IDEARCEX40L	25ms ☆	£475
IDEARCEX80L	19ms	£595
IDEARCEX120L	19ms ☆	£735
IDEARCEX200	15ms	£1035

A3000 fully internal upgrade

IDEA3IN20	23ms ☆	£375
IDEA3IN40 (ready May?)	☆	£POA
IDEA3IN60 (ready June?)	☆	£POA
Fitting if required		£25

A3000 external upgrade

(*External* drive using *internal* expansion slot; can combine with PRES Disc Buffer Board)

IDEA3EX40 etc
– prices as IDEARCEX40 etc + £10
Fitting if required £25

Additional hard discs

IDEA40L	40Mb	25ms ☆	£209
IDEA80L	80Mb	19ms	£329
IDEA120L	120Mb	19ms ☆	£475

A3000 accessories

IC PLINTH **SPECIAL!** ☆ **£18**

ideA controller cards and accessories

(For use with your own IDE hard discs; we can only accept responsibility for performance with discs we have tested ourselves)

IDEARCIN Archimedes Intern	£110
IDEARCEX Archimedes Extern	£140
IDEA3EX A3000 External	£140
Internal hard disc cradle kit	£15
Fan kit (Standard)	£10
Case with power supply & fan	£125
Fan kit (A3000 Internal)	£15

Recommended for backing up

Beebug Hard Disc Companion £35

Recommended for ease of use

ICS Task & Window Organiser £19

ICS FONTS

1st Word Plus **First Fonts**
PipeDream **PipeDrivers**
Wordpower **Power Fonts**

Please ask for details of our range of Symbol Sets and Typefaces for most printers. For example:

Star LC-10 typefaces
Black, Caldy, Outline, Pensby, Raby, Shadow, Universal £19

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For dot matrix printers with more features than PipeDream knows what to do with – provides access to resident and download fonts, ink colours, variable print size and line spacing etc £10

ODDULES

AnDi	Bai	£49
Oddule Adaptor (needed with your first Oddule unless you have an I²C socket)	Bai	£8

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Seal 'n Type (spill-proof)		
– Archimedes	Kad	£14
– A3000	Kad	£14

SCANNERS

i-Scan	Irl	£587
Scan-Light A4	CC	£341
– as above + Sheet Feeder	CC	£432
Scan-Light Junior	CC	£175
– A3000 version (internal)		£175

From our postbag

"We were most satisfied with the work you did in upgrading the A310. The hard disc has worked satisfactorily. The speed of service you gave in doing the work was appreciated. If you ever want someone to put in a word of commendation we have no objection."

1

Watford Electronics

(A member of the Jessa group of Companies – Established 1972)



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Tel: Watford (0923) 37774 Tlx: 8956095 Fax: (0923) 33642



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Archimedes micro

System	Basic	Mono	Colour	Multiscan
410/1	£1099	£1159	£1269	£1448
420/1	£1299	£1359	£1469	£1648
440/1	£1699	£1759	£1869	£2048
540/1	£2995	£3065	£3165	

Archimedes A3000

12 MONTHS FREE MAINTENANCE ON SITE

- A3000 Microcomputer **£599**
- A3000 + Learning Curve pack **£699**
- 3.5" External Drive **£99**
- Monitor Stand **£16**
- External Podule Case **£13**
- Serial Upgrade **£17**
- Technical Manual **£60**
- SCSI Card **£149**
- Dust Cover Micro only **£5**
- Dust Cover for Micro + Monitor **£9**
- User port/MIDI upgrade **£45**
- UHF TV Modulator **£30**

Unbeatable Sale Offers on Archimedes Micro

When you purchase an Archimedes Micro from Watford, look what you get FREE with it

Micro	Free Offer
A410/1	Upgraded to 2MB RAM & a 20MB Hard Disc, (A420)
A420/1	Upgraded to 4MB RAM 40MB Hard Disc (A440), MK II Learning Curve pack and Acorn DTP pack
A440/1	High Res 14" Multiscan Colour Monitor
540/1	High Res Multiscan Monitor & Panasonic KX-P1180 Printer
A3000	Upgraded to 2 Megabyte of RAM & a A3000 Monitor plinth.

+ 12 months FREE On-Site Maintenance

(P.S. Instead of the above Hardware upgrades on A410/1 & A420/1, we will fit the 30MHz Turbo Board if required. Please specify your requirement when ordering.)

Archi Accessories

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- 3.5" 800K 2nd Floppy Drive (305/310) **£118**
- 5.25" 800K external Floppy Drive **£85**
- I/O Podule (with Analogue port, User port, & 1MHz bus) **£76**
- MIDI add-on to I/O Podule **£29**
- MIDI Expansion Card **£65**
- Sound Sampler Mono (Armadillo) **£129**
- Sound Sampler Stereo /Midi (Armadillo) **£186**
- Chromalock Podule (Wild Vision) **£275**
- Econet Network Board **£44**
- Archimedes IEEE Interface Adaptor **£269**
- Dual RS232 Podule **£195**
- 16 bit parallel I/O Card **£195**
- Archi replacement mouse – New design **£32**
- PC Emulator NEW Faster Version **£62**
- Software Developers Toolbox **£149**
- Floating Point Unit **£455**
- SCSI Adaptor Expansion Card **£162**
- Keyboard Extension Lead **£6**
- 2 Podule Backplane **£25**
- 4 Podule Backplane **£38**
- Fan for above backplanes **£8**
- Risc Os Extras Software Disc **£5**
- Smoked Perspex Low profile Keyboard Cover **£8**
- Ethernet Card **£220**

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

8 Meg RAM Upgrades

- **R810** – A410/1 upgraded to 8MB **£740**
- **R820** – A420/1 upgraded to 8MB **£689**
- **R840** – A440/1 upgraded to 8MB **£579**
- **R814** – R140 upgraded to 8MB **£579**

Turbo Charge Your Archimedes

Increase the speed of your Archimedes by a factor of THREE to SIX times (depending on the software you are running), with Watford's ARM3 Upgrades.

- **ARM-3** 20MHz Upgrade Board **£325**
- **ARM-3** 30MHz Upgrade Board **£375**
- **MEMC** 1A Upgrade **£42**

(ARM 3 price includes a FREE Chip extraction tool)
(Special Offer – If purchased together with an Archimedes Micro, then not only will we fit the card Free of Charge but we will also reduce the price by £40 i.e. You pay only £285 for ARM3 20MHZ & £335 for ARM3-30MHz)

Archimedes RAM Upgrade

All our memory upgrades are simple to fit. No soldering required. Fitting instructions supplied.

- **R302**-A3000 – to 2MB RAM Upgrade **£52**
- **R304**-A3000 – to 4MB RAM Upgrade **£169**
- **R311**-A305 – to 1MB RAM Upgrade **£50**
- **R312**-A305/310 – to 2MB RAM Upgrade **£235**
- **R314**-A305/310 – to 4MB RAM Upgrade **£425**
- **R412**-A410/1 – to 2MB RAM Upgrade **£39**
- **R413**-A420/1 – to 4MB RAM Upgrade **£75**
- **R414**-A410/1 – to 4MB RAM Upgrade **£105**

Archimedes Hard Disc

Watford's ST506 Hard disc drives for A310 & A410 series fit internally into the space provided. The 'simple to follow' fitting instructions supplied makes drive fitting very easy. All disc drives are auto parking. 40Meg & 53Meg drives are fast 24mS type, while 20MHz are 28mS.
P.S. A310 upgrades require a backplane and a fan.

- **3HDP** – Hard Disc Podule only **£135**
- **3HD20** – 20Meg H' Disc + Podule for 310 **£289**
- **3HD40** – 40Meg H' Disc + Podule for 310 **£389**
- **3HD50** – 53Meg H' Disc + Podule for 310 **£474**
- **4HD20** – 20Meg Hard Disc for 410 **£165**
- **4HD40** – 40Meg Hard Disc for 410 **£245**
- **4HD50** – 53Meg Hard Disc for 410 **£335**
- A3000 20Meg Hard Disc + Podule **£345**
- A3000 40Meg Hard Disc + Podule **£459**

Convert your Archi 410 to a 420 or 440 with Watford's unique Upgrade Kits

- **UP10** – to 2MB RAM + 20MB Hard Disc **£210**
- **UP15** – to 2MB RAM + 40MB Hard Disc **£315**
- **UP20** – to 4MB RAM + 20MB Hard Disc **£265**
- **UP30** – to 4MB RAM + 40MB Hard Disc **£345**
- **UP40** – to 4MB RAM + 53MB Hard Disc **£475**

Silicon Vision

Gerber Plot	£95	Super Dump	£22
Solid CAD	£120	Solids Render	£120
Super Plot	£30	Solid Tools	£279
Arc PCB Professional	£275		
Realtime Solids Modeller	£138		

Desk Top Publisher

Acorn's Archi DTP Package	£125
Impression 2 DTP Pack	£135
Impression Junior	£79
Tempest DTP Package	£95

Archi Wordprocessors

Pendown Archi	£49	Archie Spell Master	£39
Wordwise + Disc	£24	PD Spellchecker	£40
Image Writer	£25	View	£45
Interword Disc	£24	Graphic Writer	£23
1st Word Plus – 2	£69	EasyWord	£30

Databases

AlphaBase	£36	Multistore	£195
Knowledge Organiser	£45		

Spreadsheets

Intersheet Disc	£24	Viewsheet	£45
Sigmasheet	£39	Schema	£92

Business Graphics

GammaPlot	£39	Sigmaplot	£39
Interchart Disc	£20		

Integrated Packages

- Logistix **£79**
- Pipedream 3 **£119**
- Desktop Office – Database, Graphs & Charts, Wordprocessor Spreadsheet, Communications **£98**
- Desktop Folio – Wordprocessor, Desktop & Interactive Publishing. Ideal for school environment. **£85**

Graphics, Art, Design & Games

GRAPHICS

Atelier	£65
Artisan II	£47
Autosketch II	£68
Craftshop 1 & 2	£28
Euclid 2	£52
Graph Box	£59
Kermit	£46
Mogul	£19
Poster	£79
Pro Artisan	£72
Render Bender	£58
Snippet	£26
Tween	£25

GAMES

ArcPinball	£18
Apocalypse	£21
Arcade Soccer	£15
Avon	£16
Break 147	£20
Bug Hunter	£14
Caverns	£14
Chocks Away	£18
Conqueror	£18
Cops	£14
Corruption	£18
Drop Ship	£15
Enthar Seven	£22
E-Type	£17
E-Type Designer	£15
E-Type Extra 100 miles	£15
Holed Out Designer	£15
Holed Out Golf	£15
Hostages	£15
Ibix the Viking	£14
Inter Dictor 2	£26
Iron Lord	£17
Jet Fighter	£10
Magpie	£39
Manchester United	£19
Nevryon	£14
Olympics	£15
Power Band	£20
Real McCoy	£22
Redshift	£14
Return to Doom	£16
Revelation	£54
Repton 3	£15
Rotor	£20
Sporting Triangles	£24
Superior Golf	£15
Talisman	£12
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Thundermonk	£11
Trivial Pursuit	£23
Twin World	£17
U.I.M.	£23
White Magic	£15
White Magic 2	£15
Wimp Game	£15

Miscellaneous

Ancestry	£59
Arccomm Pack	£24
Arcterm 7	£69
Armadeus Sound	£60
BBC DFS Reader	£6
Genesis	£65
Genesis 2	£125
Hearsay Comms Pack	£50
JX Archi Colour Printer Driver for Citizen & Star	£15
Numerator	£66
Rhapsody in Blue	£39
Toolkit (Clares)	£42

LANGUAGES (Archimedes)

ISO-PASCAL; FORTRAN 77	£77 each
ANSI C Release 3	£125
Assembler; LISP or Prolog X	£149 each
LOGOTRON LOGO	£55
ROBO LOGO £69 TWIN EDITOR	£25
RISC BASIC £120 BASIC Compiler	£77

Minerva's Archimedes Software

Sigmasheet	£39	Sales Ledger*	£53
Home Accounts*	£36	Purchase Ledger*	£53
Stock Manager*	£53		
Nominal Ledger*	£53	Reporter	£29
Ancestry	£59	Mailshot*	£29
System Delta+	£55	MultiStore	£195
System Delta + Reference Manual			£25
Order Processing/Invoicing*			£53
School Administrator			£118

** Requires System Delta*

NEW Business Accounts Packages
Nominal Ledger, Order Processing/Invoicing, Purchase Ledger, Sales Ledger & Stock Control
Price: **£78** per Module or **£299** for complete package

ULTIMUM – Archimedes A3000 Podule Racking System



THE ONLY LOGICAL WAY TO EXPAND YOUR A3000 COMPUTER

The accepted standard for Archimedes computer expansion is the Acorn Podule, designed initially to fit the old 310, and also for the later A400 and A400/1 series micros. The podules fit inside these computers up to four at a time. The A3000 is the little brother of the family, but can only have one podule at a time, plugging into the back of the computer.

Other attempts have been made to expand the A3000 by trying to introduce a 'mini-podule'. This is impractical for many reasons, amongst which is the reluctance of manufacturers to produce them. Nobody wants to re-design podules already produced. Some cannot be produced on a 'mini-podule' as they are far too complicated and simply wouldn't fit.

Watford Electronics listens to the demands and requirements of its customers, and we are glad to say that we have come up with the only real solution to the A3000 expansion problem. The ULTIMUM Podule Racking System allows up to three FULL SIZE standard Archimedes 300/400 series podules to be fitted to the computer. In addition, there is also provision for a hard disc drive and a podule to be fitted internally.

Since the ULTIMUM Podule Racking System takes proper full size podules, you will be able to use any of the currently available peripheral equipment, from companies like Computer Concepts, Armadillo, Acorn and of course, our own brand.

Fitting the podules to 'ULTIMUM' is simple. They are neatly fitted inside the metal case of the rack, avoiding the previously untidy method of hanging the podule off the back of the computer, risking damage to both, it and to the computer.

'ULTIMUM' has its own power supply, so no strain is put on the A3000 power supply. There is also an IEC mains output socket for an Acorn type monitor so reducing the number of plugs required to go to the mains. The ULTIMUM is rigidly clamped over the top and under the computer, and allows direct access to the floppy disc drive and reset button, rather than obstructing access as on other systems. One can also place a standard monochrome or 14" colour monitor (even a multiscan type) safely on top. The mounting method employed is so firm that the computer could even be safely transported without the assembly falling apart.

Price: £125

Archimedes A300/A400 SCSI Hard Disc Offer
(while stocks last)

100MB Hard Disc Upgrade complete with Controller card, Cables, Formatter and Manuals

RRP: £1030
Offer Price: £499

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version **Only £15**

Archimedes External Disc Drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead.
- A300/A3000 £21
- A400 £25

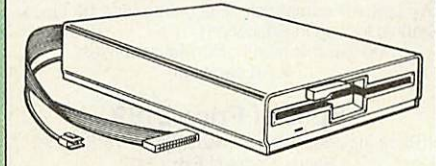
Special Education Prices

All education establishments qualify for special education prices on micros, etc. Please write in or telephone (0923) 37774 or 50335 for written quotation.

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£399** *(carr £7)*

FREE OFFER



A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control.

FREE with every BBC Master purchased from us during May

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module		£115
Econet Module for the Master		£45
Twin ROM Cartridge for Master		£9
Quad ROM Cartridge for Master		£14
Master Reference Manual I	(No VAT)	£14
Master Reference Manual II	(No VAT)	£14
Master Advance Ref Manual	(No VAT)	£17
64K Upgrade Kit for B+		£32
Acorn 1772 DFS Kit complete		£49
ECONET Upgrade Kit for BBC B		£42
ALL ECONET UPGRADES Available		
ARIES' IEEE Interface for BBC B & Master		£238
Morley Teletext Adaptor with ATS Rom		£99
Ecolink		£270

(Carr. £2 to £7 depending on the weight)

0% Finance Now Available

On Acorn Archimedes A3000 and A420/1 with learning curve packs. (Please telephone for details)

Commander Joystick

Watford Electronics' new Commander Joystick for the BBC B and Master 128K has a unique dual mode of operation giving selective free floating or self centring fully variable control in both X and Y axis directions. Commander is particularly good for flight simulation and drawing programs.

Features:
- Direct connection to BBC Analogue input port – no interface needed.
- Fully compatible with all BBC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
- Trim adjusters for both X and Y axes for fine centre adjustment.
- Convenient stick mounted fire button with additional base buttons.

Launch Price: £15

Watford's Scottish Dealer

We are pleased to announce the appointment of Messrs Computer Depot as Watford's official Scottish Dealer. The full range of our BBC/Acorn products is now available from their Dundee, Edinburgh & Glasgow shops. Their technical staff will be very happy to discuss all your peripherals' requirements.

Archi Mouse Port Splitter

Continuous plugging and unplugging of the mouse is not only inconvenient but can also damage your micro. Our handy little Archi mouse port splitter unit eliminates this risk by allowing you to connect a mouse and a joystick or a tracer ball simultaneously to your Archimedes micro. The miniature slide switch on the box enables you to select the socket to be used. **£15**

Education Software

- Advanced Folio: 7-14 years. Has the simplicity of a basic wordprocessor with the presentation quality of a Desk Top Publisher **£38**
- Colourcopter & Numbercopter: 4-7 years. Flying start in pre-reading and pre-number skills
- Colourcopter includes 7 programs to develop matching, sorting, coordination, letter & word recognition **£28**
- Numbercopter: Includes 8 programs to develop memory, sequencing, logic, number, more and gone away, word order and rhythm skills **£28**
- Concept Keyboard Podd 5-11 years: This concept keyboard version of Podd encourages less able and young children to join in the fun of discovering the 116 actions which podd can perform. Simple to operate **£23**
- Best Four languages 5-11 years: Four best selling programs which encourage children to work together to improve their linguistic ability **£33**
- Hands on Spelling 5-11 years: Promotes a visual approach to mastering spelling, linking the skill with other National Curriculum areas as hand writing, talking and reading. **£30**
- An Eye for Spelling 7-14 years: Manages and motivates children, learning to spell with individual attention. It uses Charles Cripps' visual approach to help reluctant spellers by encouraging them to look at the internal structure of words. **£24**
- Asian Folio – Gujarati 80T **£45**
- Best Four Languages **£35**
- Best Four Maths **£35**
- Frieze 7-16 years **£37**
- Kaleidoscope 7-16 years **£37**
- Merlins Castle **£22**
- Maths 9-13 years **£25**
- Number in the National Curriculum **£55**
- Screenprint pack of 5 5-16 years **£150**
- Time Traveller 7-16 years **£40**
- The Lost Frog **£22**
- World Map Study 7-16 years **£35**

(More Educational software on page 10)

Continued→ → → → → → → → → →

Archi A4 Scanner



This new A4 image scanner from Watford Electronics is supplied complete with ROM based podule software. Features provided include facilities for zooming in on an image and inverting the image in X and Y directions, saving and printing of the sprite created. Interactive help is supplied using the !HELP application on the Acorn applications discs.

The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures.

Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400 dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.

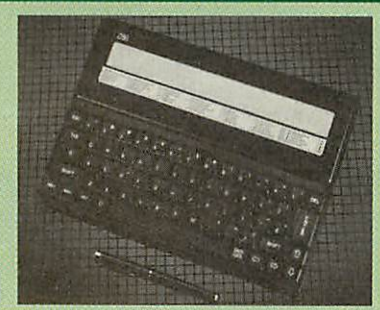
Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.

All these features and facilities combine to make the Archi Page Scanner the fast and convenient way in which to add that extra Impact, interest and clarity to documents, reports, instruction sheets, manuals, news letters, etc., from your Archimedes DTP package.

Introductory Prices:

Archi A4 Scanner	£349
Sheet Feeder for above	£95
Scanner + Sheet Feeder	£419

Z88 Portable Micro



£185

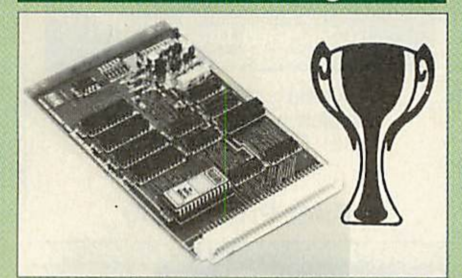
FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

Z88 ACCESSORIES

• 32K RAM Pack or 32K EPROM Pack	£18.00
• 128K RAM Pack or 128K EPROM Pack	£42
• 512K RAM Pack	£175
• Z88 Eprom Eraser Unit	£33
• Z88 Spellmaster for Pipedream	£51
• Z88 Carrying Case	£8
• Z88 Computing Book	£9.95
• AA Nicad Rechargeable Battery	£1.50
• Battery Charger Compact & Fast	£6
• Z88 Serial Printer Cable	£8
• Z88 Parallel Printer Cable	£25
• Z88 to Archi Link	£15
• Z88 to BBC Link £20 • Z BASE	£56
• Z88 to PC Link II £30 • Z TAPE	£42
• Z88 to Macintosh £52 • Z TERM	£42
• Z88 Mains Adaptor £9 • Z88 Modem	£149

Archi Real-Time Digitiser



Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £175

A Set of Colour Filters for colour image grabbing using a video camera	£16
New Risc-OS Software Upgrade	£39

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic for use in Education).

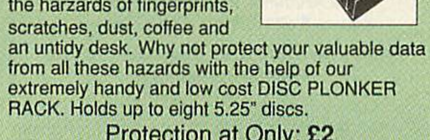
(FREE this month, PC Mouse Drivers & Art package)

Special Price £199

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£15**

Archi Graphic Tablet Junior. Working area 9" x 6". Price includes Stylus £125

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the harzards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

• Watford sophisticated DFS ROM	£16.00
• Watford DFS Kit complete	£69.00
• We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
• DFS Manual (comprehensive)	£6.95
• Acorn DNFS ROM	£17.00
• Acorn ADFS ROM only	£25.00
• Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£39.00.**

• SPECIAL PRICE	£44.00
• DDFS Manual	(No VAT) £6.95
• We will exchange your existing DFS Kit for our sophisticated DDFS for only	£30.00

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – Diskettes

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

• *10 x 5.25" S/S D/D 40T (744)*	*£5*
• *10 x 5.25" D/S D/D 40T (745)*	*£5*
• *10 x 5.25" S/S D/D 80 Track (746)*	*£7*
• *10 x 5.25" D/S D/D 80 Track (747)*	*£7*
• *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT*	*£11*
• *10 x 3.5" S/S D/D 40/80 Track*	*£7*
• *10 x 3.5" D/S D/D 40/80 Track*	*£8*
• *10 x 3.5" Double Sided High Density*	*£15*

Top Quality 3.5" & 5.25" Diskettes

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

• *10 x **M3** 3.5" D/S D/D 80 Track*	*£7*
• *10 x **M9** 3.5" D/S High Density*	*£12*
• *10 x **M4** 5.25" S/S D/D 40 Track*	*£5*
• *10 x **M5** 5.25" D/S D/D 40 Track*	*£5*
• *10 x **M7** 5.25" D/S D/D 80 Track*	*£7*
• *10 x **M8** 5.25" D/S H/D Hi-Density*	*£12*
• ***M2** 3" Double Sided*	*£2.50 each*

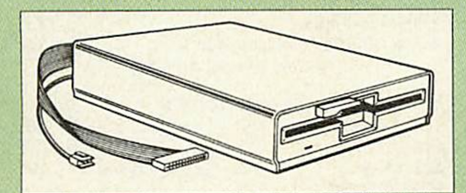


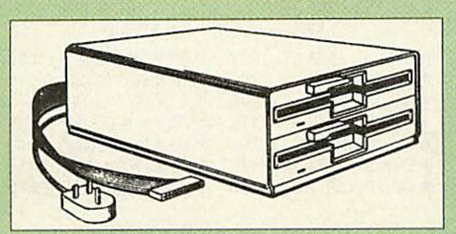
CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Quality Disc Drives from Watford

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. All 5.25" Disc Drives are 40/80 track switchable. For ease of use, the switches are front mounted. Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high qulity NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public. If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, are the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal. Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. ***Ideal for Schools & Colleges.*** *When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space. Your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 6th page of our advert for the Plinths). P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is our special Compact Disc Drive cables designed by us.*

"Test Bureau Approved for Use in Education"



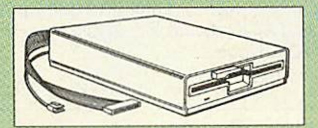


Our Disc Drives conform to BS415

Type	Description	
	Disc Drive without PSU	
• **CLS400S:**	Single, 40/80 track 400K Double sided Drive	£72
• **CLD800S:**	Twin, 40/80 track, 800K Double sided Drives	£142
	Disc Drive with PSU	
• **CS400S:**	Single, 40/80 track, 400K Double sided Drive	£82
• **CD800S:**	Twin, 40/80 track, 800K Double sided Drives	£155

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

Disc Drive/DDFS Offer



- The popular CLS400S 40/80 track switchable disc drive.
- Watford's popular Mk II DDFS Interface (allows up to 720K storage). Will run both in single & double density modes.
- A comprehensive DFS Operating manual

Bargain at Only **£119** (Offer valid until stocks last)

3.5" DISC DRIVE

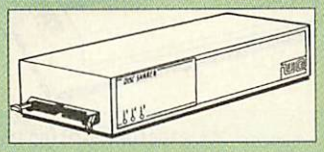


These top quality 3.5" Double sided, 80 track, are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Type	Description	
	Disc Drive without PSU	
• **CLS35:**	Single Disc Drive, 400K	£62
• **CLD400S:**	Twin Disc Drives, 800K	£109
	Disc Drive with PSU	
• **CS35:**	Single Disc Drive, 400K	£83
• **CD35:**	Twin Disc Drives, 800K	£126

(P.S. CS35 is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage)

Disc Drive Sharer

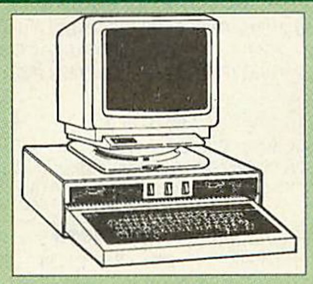


(Ideal for educational establishments)

A low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Price includes 3 Cables **£55**

Disc Drives in Monitor Stand



• **CDPM 800S** – Twin 5.25", 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC B & Master 128K micros. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

£165

• **DP35 800** – Same as above except, one disc drive is a 5.25" and the other is 3.5".

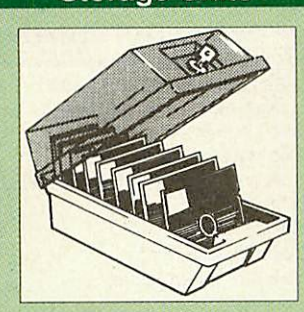
£154

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Antistatic Lockable Disc Storage Units

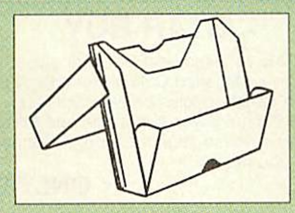


Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** – holds up to 50 5.25" discs **£4.95**
- **M85** – holds up to 95 5.25" discs **£6.95**
- **M25*** – holds up to 25 3.5" discs **£4.95**
- **M50** – holds 50 3.5" discs **£6.50**
- **M10** – holds 8 of No. 10 Data Cartridges **£15**

* Not lockable

Plastic Library Cases



Holds up to 10 x 3.5" Discs.	£1.50
Holds up to 10 x 5.25" Discs.	£2.00

Dust Covers (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

Disc Albums

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special Bulk Offer on Discs

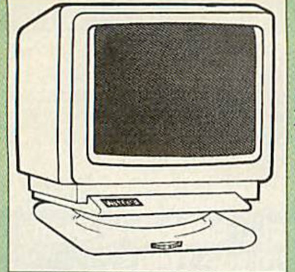
(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)



BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
• Without Sleeves 5.25"	£30	£35	£40
• With Sleeves 5.25"	£33	£38	£43
• 3.5" D/S D/D		£29 for 50	£52 for 100

Continued→ → → → → → → → →





Microvitec Monitors

- **1431** – Standard Resolution Monitor £172
- **1451** – Medium resolution, suitable for word processing in mode 0 £215
- **Cub3000** Medium Res for A3000 £195
- **1441** – High res, exceeds the capabilities of the BBC Micro £359
- **2040 CS** 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen** £239

Multiscan Colour

Eizo 9060S	£389	NEC 4D	£685
Eizo 9070S	£579	Taxan 770LR	£383
Panasonic	£325	Taxan 775	£383
NEC 2A	£289	Taxan 795-PC	£430
NEC 3D	£358	Taxan 875	£565

- VIDC Enhancer Board £25

(P.S. Taxan 795 monitor is supplied with a FREE VIDC enhancer board)

Philips

- **BM7502** 12" Hi-res Green Monitor £70
- **CM8833** 14" Med. Res Colour Monitor £178

STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor . A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £176

Dust Cover for Philips Monitors £6
(Securicor carriage on Monitors £7)

Spare Monitor Leads

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

£12

Canon Bubblejet Printers

Type	Printer	CS Feed	Ink Cart
BJ10E	£219	£54	£18
BJ300	£375	£88	£12
BJ330	£445	£110	£12

NEC Pinwriter Printers

P20	£198	P70	£485
P30	£257	P90	£655
P60	£379		

Be Satisfied Before You Buy

We have on display, various Micros, Printers, Disc Drives, Monitors, etc. Call in at our showroom to evaluate before you buy.

Concept Keyboards

Standard A3 Keyboard with BBC Software	£143
Standard A4 Keyboard with BBC Software	£117
Archi A3 Keyboard	£144
Archi A4 Keyboard	£118

FREE On-Site Maintenance

This month we are also offering at no extra cost to all our customers, 12 months, On-Site Maintenance on all Microvitec and Multiscan colour monitors, all Panasonic printers, and all Laser Printers, Roland Plotters and of course the full range of Archimedes micros. Should the machine fail, simply telephone the maintenance engineer, who will call in within 12 working hours. (Offer applicable only when bought at prices advertised in this advert. UK mainland only).

Hewlett-Packard Printers

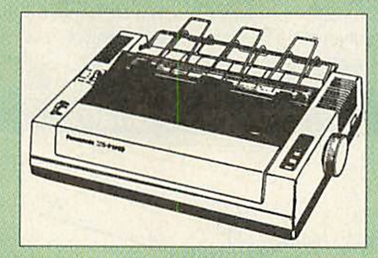
Desk Jet 500	£368	Paintjet XL	£1155
Desk Writer (Mac)	£482	Quiet Jet Plus	£376
Desk Jet Cartridge	£15	HP Think Jet	£240
Paint Jet Colour	£625	Rugged Writer	£849

- Paintjet Cartridges Black **£19**; Colour **£25**
- Desk Jet 500 256K RAM cartridge £129
- HP Epson FX Emulation Cartridge for Desk Jet £59

HP Apple Talk Interfaces for

- Scan Jet £299 • Paint Jet £POA
- Desk Jet Unlimited (Book No VAT) £19.75

Panasonic Printers



FREE with every **KX-P1081 & KX-P1180** Printers: A printer lead (please specify type required) and a Dump Out 3 ROM for the BBC Micro or 1,000 sheets of paper for other micros (please specify)

- **KX-P1081** 9pin 80col. 144/28 cps £122
- **KX-P1180** 9pin 80col. 192/38 cps £129
- **KX-P1123** 24pin 80col. 192/63 CPS £165
- **KX-P1124i** 24pin 80col. 192/63 CPS £224
- **KX-P1624** 24pin 132col. 192/63 CPS £299
- **KX-P1695** 9pin 132col. 330/86 CPS £299
- **KX-P1654** 24pin 132col. £439

Above prices include FREE, Watford's 12 months on-site maintenance

Panasonic Accessories

Cut Sheet Feeders

KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-1124 (P36)	£85	KX-P1180 (P37)	£79
KX-P1624/1695 (P38)	£124	KX-P1123 (P37)	£79

Buffers

P12	4K buffer Board for 1081	£55
P42	32K buffer Chip for 1592/1595	£16
P43	32K Buffer Chip for 1540/1124/1180	£16

Serial Interfaces

P17 P1081/1592 **£32** **P19** P1124/1180 **£55**

Citizen Printers

120D Plus	£99	124D Printer	£165
Prodot 9	£239	Prodot 24	£339
Swift 9	£149	Swift 24#	£216

- Prodot Cut Sheet Feeder £120
- Swift 24 Colour Option £32
- Swift 24 Ribbons Black £4 Colour £13

\# Special Offer this month – A FREE Colour option cartridge with every Swift 24 printer purchased from us.

Star Printers

- **LC10** 9pin 80col. 144/36 CPS £117
- **LC15** 9pin 136col. 180/45 CPS £195
- **LC24-10** 24pin 80col. 180/60 CPS £163
- **LC24-15** 24pin 136col. 200/67 CPS £305
- ***FR10** 9pin 300/76 CPS 31K 16 fonts £259
- **FR15** Wide carriage version of above £319
- ***XB24-10** 24pin 80col. 240/80 CPS £319
- **XB24-15** 24pin 80col. 240/80 CPS £389
- **XB-24** Colour Kit £35
- **LC-200** Colour 9pin 80col. 180/45 CPS £160
- **LC-24-200** 24pin 80col. 222/67 CPS £195
- **LC24-200** Colour 24pin 80col. 222/67 CPS £230

*FREE Colour Ribbon with these printers

Star Accessories

Cut Sheet Feeder

LC10/200/24-10	£65	LC15/LC24-15	£125
XB24-10	£80	XB24-15	£139

Serial Interfaces

SPC-10 LC10; LC10-II; LC10-Col; LC15; LC24-10; LC24-15; LC-200; LC24-200 £49
8K Ser LC-200; LC24-200; FR10; FR15; XB24-10; XB24-15 £64

Paper Roll Holders

LC-200; LC24-200; LC24-200 colour £29

Buffers

32K Ram Card for LC/XB24-10; 15; LC200 £55

Ribbons

LC10; LC10-II; LC15	Black **£4**;	Colour **£6**
LC-200; LC24-200	Black **£5**;	Colour **£12**
XB24-10; XB24-15	Black **£5**;	Colour **£12**

Laser Printers

Canon LBP-4	4ppm	£690
Canon LBP-8 IIIR	8ppm	£1535
Canon LBP-8 IIIT	8ppm	£1410
Epson EPL7100	6ppm	£720
HP Laserjet III	8ppm	£1035
HP Laserjet IIID	8ppm	£1539
Laserjet IIIP	8ppm	£775
Panasonic KX-P4420	8ppm*	£659
Panasonic KX-P4450i*	11ppm*	£1075
Panasonic KX-4455 Postscript	11ppm*	£1699
Qume Crystal Print Publisher 2		£1899
Star LP-8 III		£985
Star LP-8 Star(post)script		£1215
Star LP-4 4ppm		£735
Star LP-4PS Postscript 4ppm		£927

* Now 2 years warranty

Laser Toners

Canon 2 & 4	£54	Laserjet II & IIP	£55
Epson GQ	£18	Laserjet III	£75
Star LP-8	£69	Qume Crystal	£56
KX-P4420/50	£22		

Laser RAM Upgrades

IIP & III 1MB	£74	EPL7000 2M	£365
IIP & III 2MB	£109	GQ5000 512K	£95
II & IID 1MB	£76	KX4420/50 1M	£115
II & IID 2MB	£112	KX4420/50 2M	£159
II & IID 4MB	£299	KX4420/50 4M	£349
Canon LBP4 1M	£175	Star LP8 1M	£143
Canon LBP8 2M	£150	Star LP8 2M	£285

Laser Drum & Developer

Epson Drum	GQ5000	£93	EPL7100	£129
Panasonic 4420 Drum		£60	Developer	£59
Panasonic 4450 Drum		£93	Developer	£80
Qume Drum		£76	Developer	£56

Jetpage Postscript Cartridge

- HP IIP/III £255 IID & IIID £265

NEW – HP Laserjet

Various Font Cartridges	£45
Superset Font	£195

Integrex Colour Jet

- Colour Jet 132 Printer £515
- Paper Roll £6.50
- BBC Screen Dump Software £10
- Colour Cartridge £19.50
- Black Cartridge £11.25
- Black Textile Cartridge £17
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

Special Offers this month

Canon BJ 10E Printer	£219
HP Deskjet 500 Printer	£349
Panasonic KX-P1123 Printer	£162
Panasonic KX-P1592	£199
TAXAN 795 Trinitron	£435

Epson Printers

DFX5000	£1105	LQ860 Colour	£489
DFX8000	£2070	LQ1050+	£520
EX1000	£535	LQ1060	£606
FX850	£294	LQ2550+	£729
FX1050	£368	LX400	£116
FX1060	£599	LX850	£179
LQ400	£178	SQ850	£459
LQ550	£246	SQ2550	£719
LQ850+	£425		

Cut Sheet Feeders for

LX400/800/850/LQ400/500/550	£69
EX800/FX800/850/LQ800/850	£130
FX/LQ 1000/1050/SQ850	£159
LQ 2550 £390 SQ2550	£390

Tractor Feed for

LQ800 **£44;** LQ850/FX850 **£69;** LQ1050/ FX1050 **£85;** LQ2500 **£90;** LQ2550 **£90.**

Accessories

- EX800/1000 Colour Option £45
- EX800/1000 Colour Ribbon £14
- LQ2500 Colour Option £65
- Multifont Card for LQ550/850/1050 £95

Epson Printer Interfaces

All these interfaces fit inside the printer

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£95	RS232 + 8K Buffer	£75

Printer Leads

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 6'	£6
Nimbus Centronics Lead	£6
IBM/Archimedes Parallel Lead 6'	£6
IBM/Archimedes Parallel Lead 5 metres	£13
IBM/Archimedes Parallel Lead 10 metres	£19
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.
IBM Keyboard extension lead coiled	£5

Plotters

HP Plotters

• HP7440	£425	• HP7475	£615

Roland Plotters

• DXY1100	£515	• DXY1200	£655
• DXY1300	£865	• DXY2500	£2375
• DPX3500	£3385	• Sketchmate	£380
• Roland plotter Pens, Fibre tip			£7.50

Roland SketchMate

The Intelligent Graphic Plotter

The SketchMate offers the same high performance and versatile function of larger, more expensive plotting systems, but at an affordable price. It is very compact and lightweight. In restricted space, it can be operated in a tilted position. Is compatible with virtually all CAD software as well as a wide range of business softwares. The 'ArtMate' software package supplied, is designed to be used with IBM PC/AT systems.

Specifications: Plotting area: 297 x 216mm. Number of Pens – 8. Magnetic Paper holder. 5K Buffer. Parallel and RS 232 Serial interfaces. Accessories: 8 pens, AC Adaptor, 4 x Magnetic paper holders, User manual, marking sticker, Rubber sticker, 10 x A4 test paper, 2 x A4 OHP transparency film. Dimensions: 360(W) x 410(D) x 105(H)mm. Weight 2.6 Kgs.

Launch Offer: £380



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Listing Paper (Perforated)

• 1,000 Sheets 9.5" x 11" Fanfold Paper	£7
• 2,000 Sheets 9.5" x 11" Fanfold Paper	£11
• 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold	£21
• 1,000 Sheets 15" x 11" Fanfold Paper	£9
• 2,000 Sheets 15" x 11" Fanfold Paper	£16
• 1,000 Sheets true A4 Fanfold Paper 70gms	£11
• 2,000 Sheets true A4 Fanfold Paper 70gms	£21
• Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

Printer Labels

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£6.00
1,000 90 x 36mm (Twin Row)	£6.25
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.75

Special Offer

Hitachi/Acorn 12" High Resolution, ergonomically designed Colour Monitors. Supplied complete with a swivel base and a BBC lead.

Only: £145 (While stocks last)

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
Brother HR15/20	£6.00	–
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£2.75	£4.50
DMP2000	£2.75	£4.75
EX800/1000	£3.50	£5.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£3.25	£6.00
LQ1050/LQ2500	£4.00	–
LX80/86/800/850	£2.75	£4.50
LX400	£3.50	£5.00
M1009/GLP	£2.95	£3.75
NEC P2200	£4.50	£5.00
Panasonic KX1080/81	£3.25	£4.75
Panasonic KX-P1124	£7.50	£5.00
SQ2500	£23.00	£5.50
Star LC10/NL10	£2.75	£5.00
Star LC24-10	£2.95	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£9	

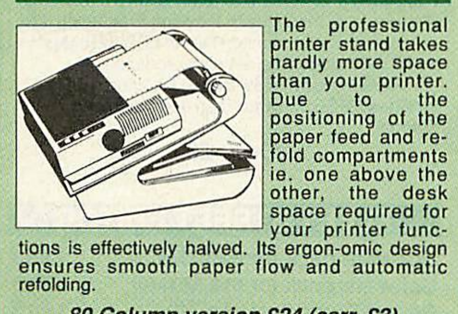
Our attractive Dust Covers are manufactured from translucent PCV. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595	£7
P115 for KX-P1180/P1624	£7
P145 for KX-P1124	£8
P140 for KX-P1540	£10
Colour Ribbons for KX-P1081, 1592 & 1595 Brown, Blue or Red	£9.95 each

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergon-omic design ensures smooth paper flow and automatic refolding.

80 Column version £24 (carr. £3)
132 Column version £29(carr. £4)

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments)

Connects	Serial	Centronics
2 to 1	£16	£17
3 to 1	£22	£24
5 to 1	£36	£32

(Cables extra at £6 each. Please specify type required when ordering)

2 Way Compact Printer Switch

A handy 2 way printer switch. Enables one micro to be connected to 2 printers or vice versa.
Centronics **£18;** Serial **£17**
(Cables extra at £6 each)

Auto Printer Sharer Switch

Connects	Serial	Centronics
2 to 1	£36	£39
4 to 1	£59	£55
8 to 1	–	£85

256k Multi Spooler

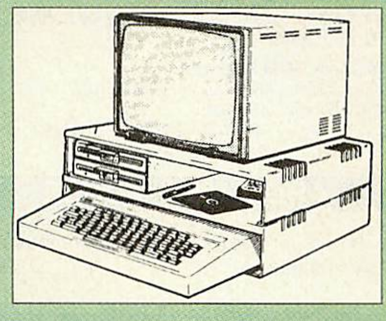
These Auto Centronics Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

- 2 In/2 out **£135** • 4 In/2 out **£169**
- 8 In/1 out **£199**

Compact Converter Units

Serial to Parallel **£36** Parallel to Serial **£37**

Plinths for the BBC B & Master 128K Micros

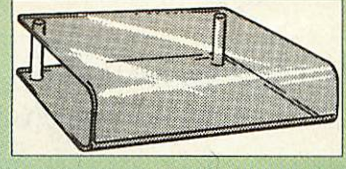


Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid. Colour: Matching BBC Beige.

Single BBC Plinth	420 x 310 x 105mm	**£13**
Double BBC Plinth	420 x 310 x 210mm	**£24**
Single Master Plinth	490 x 310 x 105mm	**£14**
Double Master Plinth	490 x 310 x 210mm	**£26**

(Carr. Single plinth £2; double plinth £3)

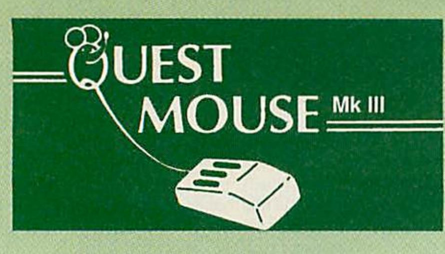
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	**£16** (carr £3)
136 Column version	**£20** (carr £4)

Continued→ → → → → → → → → →



- Quest Mouse III & Quest Paint £59
- Quest Mouse III, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse III only £30
- Quest Paint Software only £34
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Quest Colour Dump Disc – This new software allows you to print direct from Quest Paint to your Integrex Colour Printer £18

(P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software



Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

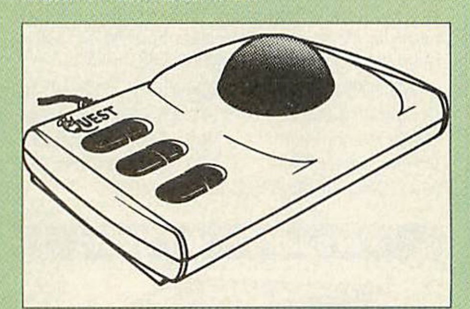
ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £32

Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version **£27**
QT-20 Archimedes Version **£30**

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£46

THE NEW Mk III AMX MOUSE

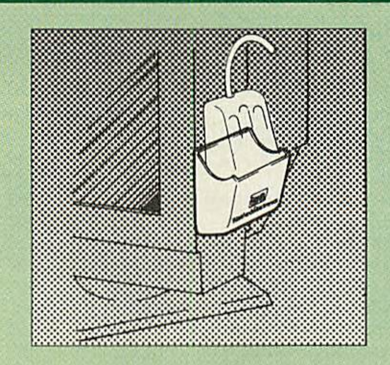
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

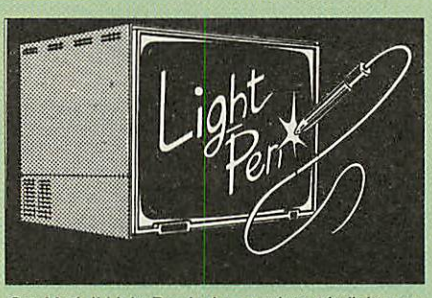
MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE Mouse House



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk.
It protects it from damage when not in use, yet within easy reach when you need it again. At £4 it does not cost a rodent's ransom.

Price £4



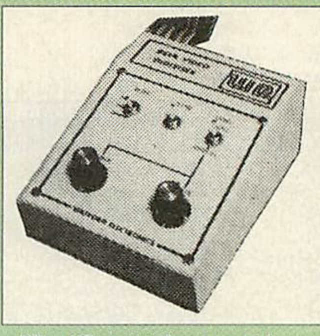
Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro. This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket. The software supplied includes a sophisticated, fast screen dump routine.
Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

£109 (Carr. £5)

(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

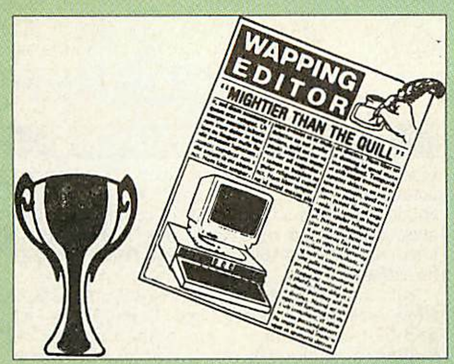
The Beeb HandScan

Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.
The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.
All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware **£135**



Winner of the BBC Acorn User 1990 Award for the Best DTP/Word Processor

The Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

Page Layout Section

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module incorporates the facilities like: pencil, brush, airbrush, polygon, circle, eclipse, fill, cut & paste, etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

Word-Processor

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

The Font Editor

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.
Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser.

Wapping Editor Software Pack	**£69**
Wapping Editor plus Mouse	**£89**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)



At the request of many of our customers we are now able to offer training in the use of Wapping Editor DTP package. For further information please telephone 0923 37774 and ask for Tim or Shiraz

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

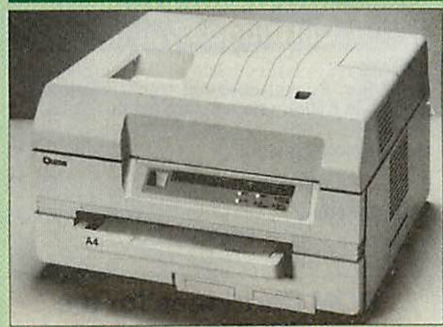
Wapping Font Disc 1

Sixteen additional fonts, including smaller version of Oberon and Daisy and two new sizes of the standard font for the Wapping editor.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions. **£12**

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts for the Wapping Editor DTP pack. (80 track discs only). **£13**

Laser Direct



By using the power of the Archimedes RISC processor, it offers the best of both worlds – print speed up to 5 times faster than typical Laserjet compatibles – uses outline fonts so that any font can be scaled to any size – works with all programs that use RISC OS printer drivers. Ideal for use with Genesis, !Draw, Acorn DTP, Impression, etc. Includes 50 sheet paper tray and a single sheet/envelope tray. Requires one expansion slot and at least a 2Mbyte Archimedes. A very compact printer, a very low initial cost and very low running costs.

Special Price: £849

- Special High Res Laser Direct Card 600 DPI for Canon LPB4 Laser Printer **£325**
- LPB4 Printer plus High Res Card **£1025**

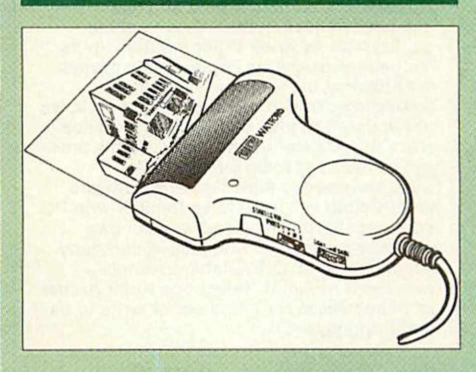
(For demonstration, call in at our retail shop)



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

All prices are exclusive of VAT

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system, for only £149. The package includes the most comprehensive utility software available for the Archimedes, a high quality hand held scanner, and all necessary documentation to get you going straight away.

SCANNER

The scanner is capable of scanning up to an amazing 400 dots per inch (DPI)! The scanning area is 4" wide, and the height is only limited by the maximum amount of memory available. The dot resolution may be switched to 100, 200, 300 or the maximum 400 dpi. One of four operating modes may be selected offering either pure monochrome scanning, or one of three grey level modes. The grey level modes use different size dither patterns to represent up to 16 shades of grey. There is also a dial to allow the "brightness" to be adjusted over a wide range, in order to optimise the quality for any specific image. The scanner interface is a standard, single width, expansion card (podule) which plugs into the Archimedes' backplane. The socket on the rear panel connects the scanner by 1.8 metres of cable.

SCANNER SOFTWARE

Full use is made of the windowing and the multi-tasking facilities of RiscOS. The software is supplied in a 64Kbyte ROM located on the interface board. The scanner appears as a small icon on the desktop icon bar, and the software is retrieved from the ROM simply by clicking on that icon. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. The other facilities included in the software are.

Cropping and scaling to any size including stretching and squashing in X and Y direction separately.

Colour tinting.
X and Y flip.

Edge detection which turns solid objects into outlines.

Selective directional copying which allows features (i.e. lines or text) to be made thicker or thinner.

Scanned images may be saved as sprite files or transferred directly into other RiscOS applications (DTP, Draw, Paint) simply by dragging the sprite file into the application's window. Sprites may also be generated using anti-aliasing. This greatly improves picture quality and is particularly effective when scanning material with a range of grey tones, such as photographs. Images can be printed on any printer that is supported by a RiscOS printer driver, with optional settings for portrait or landscape modes, image scale and positioning. Images are printed using the full resolution of the printer and are not limited to the screen resolution.

On-screen help is provided via the RiscOS interactive help facility. Calls are also provided in the ROM for users wishing to write their own software, incorporating the use of the scanner.

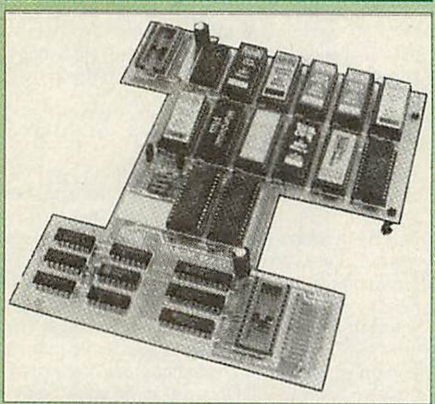
AHS-4 Archi 300/400 Version	**£149**
AHS-3 Archi A3000 Version	**£175**

Continued→ → → → → → → → → →

STAFF VACANCIES

Watford Electronics is the leading supplier in the Acorn computer field and has established itself in the PC compatible market with its Aries PC computers. In its eighteen year history, Watford has always kept itself at the forefront of the new technology. Due to our latest expansion, we require staff to man our BBC/Archimedes and PC Technical Departments. Applicants will be required to be familiar with BBC/Archimedes hardware and software, and PC staff will need to be familiar with PC computer hardware. Good rates of pay, excellent prospects. Subsidised company accommodation is available to single persons if required. Telephone Keith Archer or Shiraz Jessa for interview, or write to us enclosing your CV.

Solderless Sideways ROM Socket Board



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

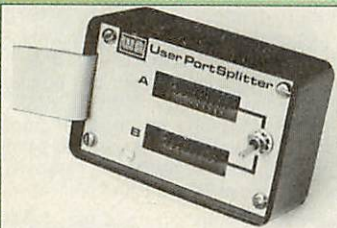
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8.50**
(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

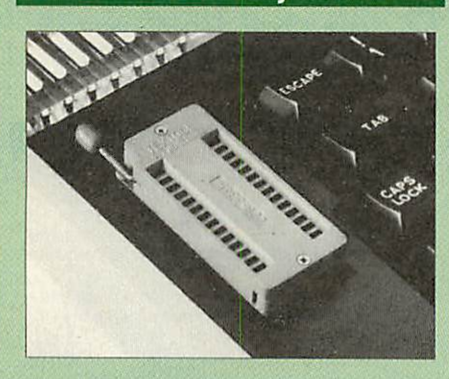
User Port Splitter Unit



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22** (carr £2)

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B and B+ compatible.

ONLY **£18** (carr £3)

BBC B Low Profile Cartridge System

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

- Complete System **£11**
- Spare Cartridges **£2.75**
- Spare Rack **£1.65**

ROM Cartridges for the BBC Master

Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£9**; Quad **£14**

16K Disc Ram Module

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional Battery back-up fitted **£3**

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£69** (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

Aries B-488 IEEE-488 Interface Unit

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

Voltmace Joysticks

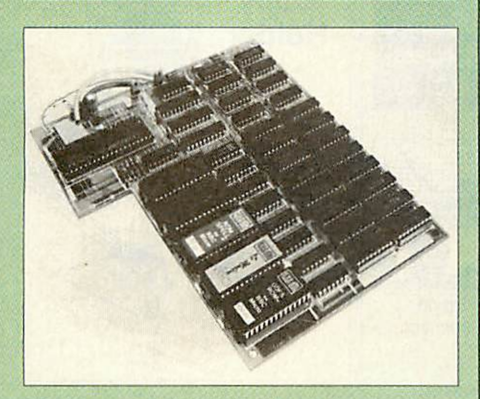
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

ROM/RAM Card



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

PRICES:

- ROM/RAM card with 32k dynamic RAM **£48**
- ROM/RAM card with 64k dynamic RAM **£65**
- ROM/RAM card with a massive 128k dynamic RAM **£109**

(carriage on ROM-RAM Card £3)

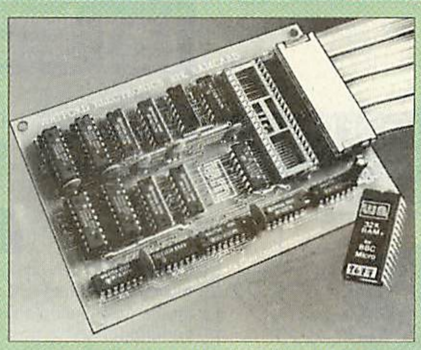
OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £9
- 16k Dynamic RAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches £2 each

Complete ROM-RAM board All options installed £115

P.S.
IS your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K Shadow RAM/Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138, 145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)

(Price includes a comprehensive manual and the ROM)

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £20.00
- Maths with a Story 2 (Disc). 4 further maths programs. £20.00
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. £17.00
- ECOLOGY O-Level program. £20.00
- POLYMERS O-Level program. £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. £20.00
- ADVANCED TELETEXT SYSTEM £8.65
- PERIOD TABLE SOFTWARE £20.00
- Computers at Work – Primary £17.35
- Introducing Geography 11-17 years £17.50
- Electric Fields 6-14 years £11.25
- Espana Viva – 3 Discs £19.95
- WHITE KNIGHT Chess game £16.00
- A Vous La France £29.00

More Educational Software

- **FUN SCHOOL 2 – Red:** Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a Letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic. **£12.00**
- **FUN SCHOOL 2 – Green:** 6-8 yrs – Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump **£12.25**
- **FUN SCHOOL 2 – Blue:** Over 8 yrs – Eight programs on Disc, Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape. **£12.50**
- **FUN SCHOOL 3 – Red £19.95**
- **FUN SCHOOL 3 – Green £19.95**
- **FUN SCHOOL 3 – Blue £19.95**
- Six French Games – Aimed at pupils in their first year of French, but also useful as revision for more advanced students 11 years+ £26
- More French Games – Another 6 games 12 years+ £26
- Au Restaurant and Accident de Route 12 years+ £26
- Boulogne and Oh-Les – 2 programs for beginners £26
- Letters to French Penpals – 11 years+ £26
- French Programs with Henri Beret – The programs in this series present vocabulary, grammar and role-play phrases in the form of animated games. 11-16 £22
- Six German Games – Aimed at pupils in their first year, but useful as revision for more advanced student of German. 12 years+ £22
- More German Games – Aimed at pupils in their 2nd year of learning German. 12 years+ £22
- The Cloze Program – Using context clues to predict is much more than a gap filling exercise. All ages £26
- An Introduction to Electronics – Brings together all the basic electronics required for a GCSE Physics or CDT course. 14-16 years £26
- Computer Control – This is a package of 3 programs simulating control of a greenhouse, a robotic arm & a chemical plant. 14-16 years £26
- The Nuclear Reactor – An interactive, menu driven program for GCSE pupils. Demonstrates & explains nuclear fission & the chain reaction. 14-16 years £22
- PUNCMAN Learning punctuation
  - Puncman 1 & 2 for 7 – 13 years £15
  - Puncman 3 & 4 for 8 – 14 years £15
  - Puncman 5 & 6 for 8 – 15 years £15
- Yes Chancellor – A chance to take over number 11 at Downing Street. 12 years+ £18
- Letters & Pictures – Introduces phonic skills to Infants 6-8 years £15
- Numbers & Pictures – Early number learning is a great fun (4-6 years) £15
- Note Invaders – Budding musicians can learn the notes on the Clef with this elegant game 3 programs (7 to Adults) £15
- Maps & landscapes No. 1 (9-14 years) £18
- Help Your Child learn Basic Map work No. 2 (9-14 years) £18
- Pirate – Educational Adventure (8-14 years) £15
- Spelling Week by Week (6-14 years) £18

Archimedes Software

- Bookbinder £43
- BUMPER DISC £14
- Bumper Disc 2 £14
- Craftshop 1 £26
- Craftshop 2 £26
- Desktop Stories £27
- DigiSim £35
- Droom £17
- Jiglet £27
- Jigsaw £28
- Numerator £60
- Snippet £26
- Fun School 2A Red (up to 6 years) £12
- Fun School 2A Green (6-8 years) £14
- Fun School 2A Blue (8 years +) £14
- Gate Array Teaching System £68

Continued→ → → → → → → → →

Computer Concept's ROMS

Communicator	£49
Disc Doctor	£28
Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
Mega-3 ROM	£76
Spell Master	£42
TERMI	£25
Wordwise	£24

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and view.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only £24

(N.B. Word Aid requires a Disc interface in your Micro)

Acorn ROMS

View 3.0 ROM	£45
View Professional	£50
Viewsheet (Acornsoft)	£36
Viewstore	£36
Viewspell with 80 track disc	£25
Viewplot Disc	£20
(Please specify for Master 128 or Compact)	
View-Index	£12
Overview packs 1 & 2	£65
Hi-View	£38

MINI OFFICE II

DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.00
DISC Version for the Compact	£18.00

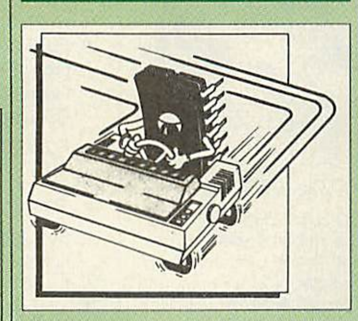
(When ordering please specify for which Micro & 40 or 80 track Disc)

All prices are exclusive of VAT

View Printer Driver Discs

Epson FX & RX 80	£10
Juki & Brother HR	£10

View Printer Driver ROM



View is a powerful word processor, but it seriously lacks in terms of printer driver support. With the View Printer Driver ROM, the View users will find themselves in the realms of advanced word processing.

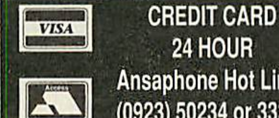
The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

Price: Only £33



OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

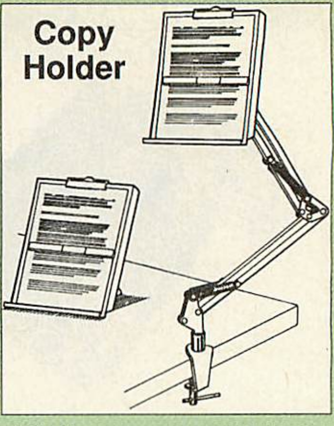
BEEBPLOT – Provides visual representation from Spreadsheet data.

Only £10 (Disc)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £14

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£7** (carr. £3)
Angle poise **£12** (carr. £3)

The Epson RX/FX/KAGA Printer Commands Revealed Handbook

Printer Commands Revealed

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out? Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

ALL PRICES EXCLUDE VAT

BOOKS
(No VAT on Books)

15 Hr Wordprocessing BBC/View	£6.95
15 Hr Wordprocessing BBC/WW & WW+	£6.95
30 Hour BASIC (BBC Micro)	£12.95
1st Word Plus Rel. 2 Manual	£10.00
A3000 Technical Manual	£29.00
Acorn DTP A Guide to	£17.00
Advanced User Guide for BBC	**£10.95**
Archimedes 1st Step – Beginners Guide	£9.95
Archimedes Assembly Language	£14.95
Archimedes BBC Basic Guide	£20
Archimedes DTP Manual	£10.00
Archimedes Operating System	£14.95
Archimedes Risc-Os Programmers Reference Manual	£79.00
Arm Assembly Lang. Prog. Manual	£15
Assembly Language Quick Ref.	£21.95
BASIC 2 – User Guide	£2
Basic V – A Dabhand Guide	£9.95
BBC Basic Guide (Archimedes)	£19.95
BBC Computer Handbook – The Complete	**£14.95**
BBC Micro – Within the	£11.95
BCPL User Guide	£9
C Big Red Book of	£8.95
C – A Dabhand Guide to	£14.95
C Programming Lang. 2nd Edition	£24.95
COMAL – Introduction to	£9.50
Deutsch Direkt! (Book only)	£5.95
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
FORTH on the BBC Micro	£9.95
Hackers Handbook – New	£9.95
ISO-PASCAL Reference Manual	£9.95
Mastering Interpreters & Compilers	£14.95
Master 512 Guide – Dabs Press	£9.95
Master Operating System	£12.95
Master Reference Manual Part 1	£14
Master Reference Manual Part 2	£14
Master Reference Manual – Advanced	£17
Mathematical Programs in BBC BASIC	£9.95
MINI OFFICE II – A Dabhand Guide	£9.95
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It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

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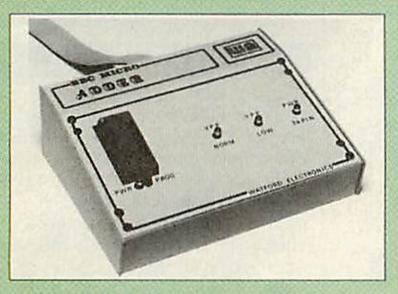
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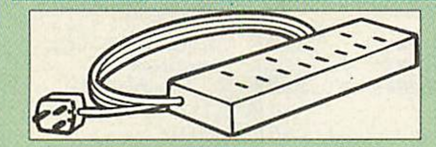
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In his independent review (Computer Shopper) the reviewer writes, 'The Aries Portable offers exceptional value for money . . . The computer itself is very much what you'd expect a notebook to be, small, with a cramped but very usable keyboard and a respectable backlit display. It is nice to see that you can actually use the extra 384K as EMS memory – there is even a utility that can turn the EMS into a RAM drive for you.'
In his final verdict he writes, 'Overall, the single most outstanding feature has to be the price tag. A notebook PC with hard disc for under £1,000 has no competition at the moment. If you have a small briefcase, weak arms, or just like the concept of a truly portable computer, then this is your man'.

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EIGHT BITS

I have some good news and some bad news this month, and I'm afraid the good news isn't going to make much sense without the bad news first, so here goes; this, my first stab at the eight bit section of Hints and Tips, is actually going to be its last appearance. The good news? Well, from next month I'll be teaming up with Risc Revue co-ordinator Dave Acton, and between the two of us we will be presenting a new combined column of eight and 32-bit programming ideas, techniques and examples. Apart from the usual batch of reader submissions we hope to cover areas of programming interest liberally smattered with examples for both the BBC and the Archimedes. In this respect, if you have a query about a particular subject, whether it be random number generation, sprite plotting, floating point arithmetic, hash tables or podule headers, do send it in and we'll see what can be done. Don't forget to keep your eight and 32-bit submissions coming in. All programs are most welcome, and who knows, you may even get a tenner for your efforts!

Dave Lawrence

£20 COLOUR PRINTING

Listings 1 and 2 this month come from **Garry Quested** and demonstrate the way two banks of screen memory can be used to provide more than the usual number of colours on screen. The basic technique used in this program has been used in a number of similar programs over the years, mainly in the production of screen lines with 512 lines instead of the usual 256. Listing 2 gives a four colour mode 0 display and listing 3 gives 16 colours in mode 1. The principle behind the programs is very simple; a frame sync event is setup which changes the palette and swaps the screen bank displayed (between 'normal' and 'shadow'). Ideally all the VDU drivers should be re-written to access both screen banks, but Garry has just written a very simple Basic procedure (PROCstring) which prints a string of characters in a given colour (0-3 for mode 0, 0-15 for mode 1) at a given screen position on both screen banks.

This is 16 colour Mode 1

This is colour number 1
This is colour number 2
This is colour number 3
This is colour number 4
This is colour number 5
This is colour number 6
This is colour number 7
This is colour number 8
This is colour number 9
This is colour number 10
This is colour number 11
This is colour number 12
This is colour number 13
This is colour number 14
This is colour number 15

This is four colour Mode 0
in other words, eigthy columns in quadricolour!

This is colour number 1
This is colour number 2
This is colour number 3

MORE COLOURS FROM MODE 1

As the screen banks (and palettes) are swapped every frame sync, the text on the screen therefore appears in two different colours but in the same position, this gives the illusion of the text being in another colour. Unfortunately the frame rate effectively drops from 50 to 25 and some colour combinations can flash quite violently!

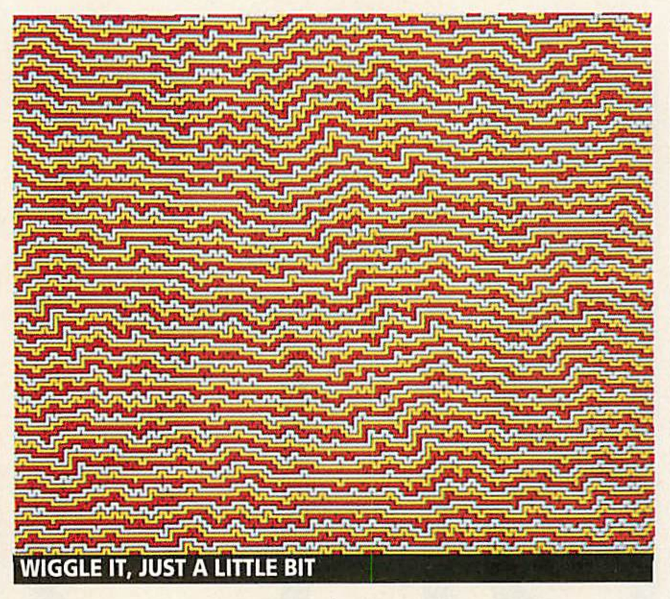
Changing the colours available is a little tricky due to the way the palette is updated. The usual VDU 19 command is too slow to be used in an event so the palette register is directly poked. This is a hardware register mapped into memory at &FE21. The top four bits contain the 'logical' colour and the lower four the 'physical' colour EORed with 7. In two-colour modes (such as mode 0) only the top bit of the logical colour is actually used, but all possible combinations of the other three bits must be programmed as well. This can be seen in the .chcols loop. Note the two initial values of &F6 and &F5 at .mem, these correspond to colour 1 (6 EOR 7) and colour 2 (5 EOR 7). In four colour modes (such as mode 1), bits 7 and 5 are used to determine the logical colour, but again the other 'top' bits must be set to all their possible values to ensure correct programming of the palette. This is reflected in the two tables .col1 and .col2. Each line contains all possible combinations of bits 6 and 4 along the physical colour numbers EORed with 7. Page 380 of the Advanced

User Guide gives more details about how to program the palette in other screen modes. If you want to change the colours that either of these programs use, you should change the lower four bits in each of the relevant lines at .mem or .cols1/.cols2.

Garry finishes off by saying not to scroll the screen, because all sorts of odd things will happen, and don't forget to plot, draw or print everything on both screens as you're likely to end up with quite a messy screen otherwise!

£20 A WIGGLE A DAY

This rather fun graphical ditty comes all the way from **D Parry** in County Durham. It's really just a suck-it-and-see program, there's not much to describe! All that happens is four flags (D% - G%) are set. These say if a line can move forward (one or two spaces), down or forward and down. A few conditions are then examined to determine the direction the line should move in. PROCflat is called if the line is boring and flat, in which case there is a one in 10 chance of producing a 'bump' to make the next line up more 'interesting'. s% is the step size – a bigger number will produce bigger 'bumps' and the RND(10) can be increased or decreased to produce a more jaggy pattern. The pattern's attraction is really in its simplicity – it's all done in Basic and it doesn't take half an hour to calculate and plot.


WIGGLE IT, JUST A LITTLE BIT

£20 6502 AND ALL THAT

This is one for all dedicated Beeb hackers, and I'm afraid you'll never get the accompanying program to work on a Master. Have you ever examined a list of the 6502 opcodes and wondered why there are so many gaps? In fact out of the 256 possible values, only 151 are used, these are taken up by the various 'base' instructions such as LDA, EOR and BEQ and all the relevant addressing modes (immediate, zero page, absolute, X etc). The other 100 or so instructions are a mystery! Not for much longer though, thanks to **Peter Briggs**. He has let me have a full list of all 6502 opcodes including most of the 105 'unknown' ones. This list appears on page 90 of the yel-

low pages. The extra opcodes are actually illegal, undocumented and are not guaranteed to work on all 6502 processors. However, you will find that most later 6502s can able to execute most of these instructions. My old Beeb has an 'SY6502A' in it, and it seems to handle them OK.

If you read through the list you'll see that many of the extra opcodes are very peculiar and not particularly useful. Most of them combine two 'legal' opcodes and perform both operations together. For example, &A7 loads the accumulator and X register with the same zero page value, while &67 rotates a zero page location right and adds it to the accumulator. All the &x2 instructions (&02, &12, ..., &F2) except &A2 (which is LDX immediate) are HALT instructions, these cause the processor to go into an infinite loop which only BREAK will cure. There are also a number of extra NOP instructions, most of which take a zero page or absolute address – very odd!

I must admit that I haven't had this list long enough to try out all the instructions, although I did manage to knock together a program to demonstrate five of the more useful ones (listing 1 on the yellow pages). Obviously the BBC's assembler doesn't know about these instructions, so you have to 'manually' assemble them with the appropriate EQUB, if you look at the commented lines in the listing you'll see what I mean. If you run the program, it will show each instruction as it tests it, followed by the status of the appropriate registers and memory locations before and after execution of the instruction. It will also show what it expects the values to be. These can be used as a guide to see if your particular 6502 'knows' about these instructions. Pete didn't supply any instruction timings or further details such as how the instructions affect the flags, so you'll have to experiment yourself to find out exactly what INC-SBC abs,X (opcode &FF) is capable of! As you may notice, this list still isn't complete – there are 10 or so question marked opcodes. I'm afraid I can't supply any information on these, the list is as Pete supplied and there were no further comments about their purpose!

So why won't these opcodes work on a Master? Well, both it, and the Compact are based around the 65C02, the CMOS version of the 6502 and when this chip was introduced, the function of all the opcodes was rigidly defined, so you get instructions such as PHY, TRB and BRA where these undocumented codes on the plain 6502 used to be. Interestingly, the STZ absolute (store zero) opcode was carried over to the 65C02 and has remained in the same place between the two processors (&9C). Funnily enough, I tried running my demonstration program on *65Host* on an Archimedes and it correctly executed both STZ and LDA/LDX before falling over in a big heap at the TXA/AND with an 'Illegal opcode' error. This does rather imply that Acorn, at least, knows about these instructions and quite possibly used them in BBC programs and had to emulate them in *65Host* to ensure they still worked! It may also imply that the vast majority of 6502s are capable of executing these two particular instructions. If any readers are particularly bored one day, perhaps you could try out these opcodes on your Beeb and let me know the results along with what particular brand of 6502 you have. If there is enough interest we might publish a compatibility list in a future issue.

One final point, the 65C02 is entirely pin-compatible with

the 6502, and it is possible to replace the 6502 in the Beeb with a 65C02.

I remember doing this to my Beeb a long time ago, although I swapped 'em back sharpish when I found that *Revs* didn't work properly, I think I now understand why. Naughty Mr Crammond was using nasty opcodes!

£10 CLASH OF THE KEYS

Tris Mabbs, a contributor to *Acorn User* from a long time ago has recently resurfaced with this handy little utility to detect potential key clashes when reading the keyboard with INKEY-. Games players may find key clashes particularly annoying – you go to press 'right' 'while holding down 'up', forgetting to release 'down' only to find you've let off your last smart bomb or worse still you've quit the game! These situations cannot be avoided completely, but can be kept to a minimum. If you examine the keyboard matrix shown on page 490 of the Advanced User Guide, you'll find that key clashes occur in squares. For example if you write a program which detects K being pressed and hold down 3, F7 and A, the program will think you're pressing K! If you look at the matrix you'll see that these four keys actually form the corners of a square.

The INKEY- values correspond directly to the position of the key within the matrix, so it is fairly simple to analyse the keys being pressed and indicate any possible key clashes. If you run the program, you'll find it displays the names of the keys in a grid on the screen. If you press a key it will highlight it in green and then search for any key clashes, if any are found it will highlight them in red. This process takes a couple of seconds so it will beep when it is ready to accept the next key. You can therefore enter all the keys you wish to use one at a time. If any of them become highlighted in red you'll know you have a clash. I'm afraid that due to the nature of the program being able to detect any key press (including ESCAPE), the only way to quit is to press BREAK...

ONE LINE GAME

This is a one-line game I wrote many years ago when Acorn Abuser was into these things. The game is a version of that old classic, *Mastermind.* Type the line in very carefully, making sure not to add in any extra spaces and RUN it. The computer thinks of a random four digit code made from the numbers 0-9, repeated digits are possible – it was too complicated to check for this in one line! You get as many goes as necessary to guess the computer's code. You'll be marked each time with the number of correct digits in their correct places and number of correct digits but in the wrong place.

Be careful when you're typing in your guess as there is no way of correcting typing mistakes. I'm afraid it was too long ago to remember exactly how it works, I can only recall that it took a great deal of careful thinking and some ridiculous Boolean logic statements to get the whole thing onto one line.

I mean, what on earth does E=(V=t?T)*(V>0) actually mean! Hmmm, I wonder if (another) one-line computer guessing *Mastermind* could be written...

BOUNCING LINZE

This is the last ever offering from the 'old-style' Eight Bits. It's a graphics 'nicety' from

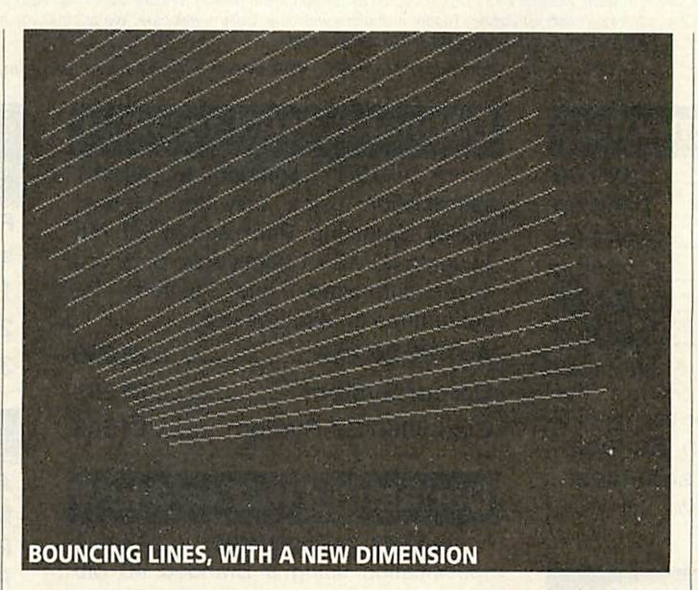
James Richards in York and it's very simple but quite hypnotic to watch. The program controls two points, between which a line is drawn.

When a point reaches the edge of the screen it is made to bounce back.

This looks quite effective as it is but with the introduction of a simple PRINT command to make the screen scroll up, the program is transformed into a pseudo 3D vector generator.

There is a little bit of redundancy in the part of the program that deals with the 'bouncing'. James uses four variables, top%, left%, right% and bottom%, which are made true when the line hits the relevant side of the screen.

This means that you can easily add your own version of the routine to change the direction of a line. James suggests you connect a microphone to the analogue port and use four new lines to test when a certain level is reached, then if you ever change one of these four variables the line will change directions.



BOUNCING LINES, WITH A NEW DIMENSION

If you get the level right the line will bounce with the beat! You may like to add more lines (especially if you happen to have access to an Archimedes) by increasing the size of the two arrays x%, y% and their respective vector arrays, xv% and yv%.

Four lines will give you a Max Headroom-type of display. Go on, you remember the one that used to glide behind the ever-popular computerised television presenter?

THANK YOU

That's the end of Eight Bits for this month and technically for ever!

Please keep your submissions coming in, no matter how 'useless' you think they are, I'm sure someone, somewhere would be very glad of your knowledge and insight into some problem! The address is: BBC Acorn User, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.

I'd like to thank David Atherton for his masterful management of this column over the years and hope he approves of the new creation.

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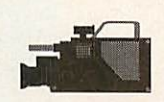
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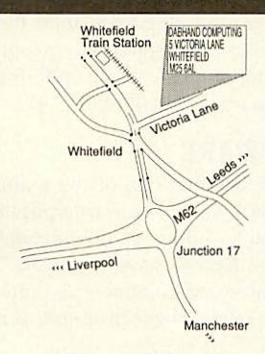
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Communication is something we take for granted. Messages, sounds, pictures and video signals are constantly being exchanged electronically, with computers being used increasingly to manage this information.

In this series, I'll be exploring how your BBC or Archimedes computer can help you enter the fascinating and useful world of on-line communications.

The comms revolution is in full swing. Millions of people around the world use computers connected via the public telephone system to other, usually bigger, computers in order to access vast information databases and services – Prestel and Telecom Gold systems are examples.

These large host systems offer a wide range of services, including the booking of airline, railway or theatre tickets, access to timetables, teleshopping, up-to-the-minute news and specialist information databases.

INSTANT ACCESS

All of these useful services and facilities are instantly accessible via most microcomputers, including BBC and Archimedes computers, which have well-earned reputations in this field. Besides the commercial host systems, there are countless privately-operated bulletin boards (BBs), which usually consist of a single telephone line with a computer running host software of varying complexity. You might have heard of systems like CIX (Compulink Information Exchange), The World of Cryton, Archive BB and many others. These usually offer vast amounts of free downloadable programs, or telesoftware, as well as news, ideas and gossip on the message boards.

Many BBs are interconnected via a simple message exchange system – you leave a message on one system and at regular intervals the messages received are automatically transmitted in batches to other BBs. A message left on your local BB one day could end up overseas in a matter of hours – this is electronic mail in its simplest form.

Once you've used electronic mail (or email), it is often hard to understand why people bother with conventional post, often referred to by comms enthusiasts as 'snail mail'.

TELESOFTWARE

Research indicates that one of the main reasons computer users invest in comms equipment is to tap into the rich supply of downloadable software available. Known as telesoftware, you can download it into your computer and most of it is public domain (PD). These programs range from simple demonstrations (or demos), through to useful utilities and even near-commercial quality applications.

Besides programs, you can download datafiles, like music samples and pictures. Gaining great popularity now is 'shareware', which are programs which can be freely distributed and used, but you voluntarily pay the author a modest sum if the program is useful to you.

Telesoftware is also a good way for companies to distribute software upgrades and patches. Acorn's own on-line service, the Support Information Database (SID) is a perfect example of this. Earlier this year, revised Risc OS printer drivers were made available free of charge on SID.

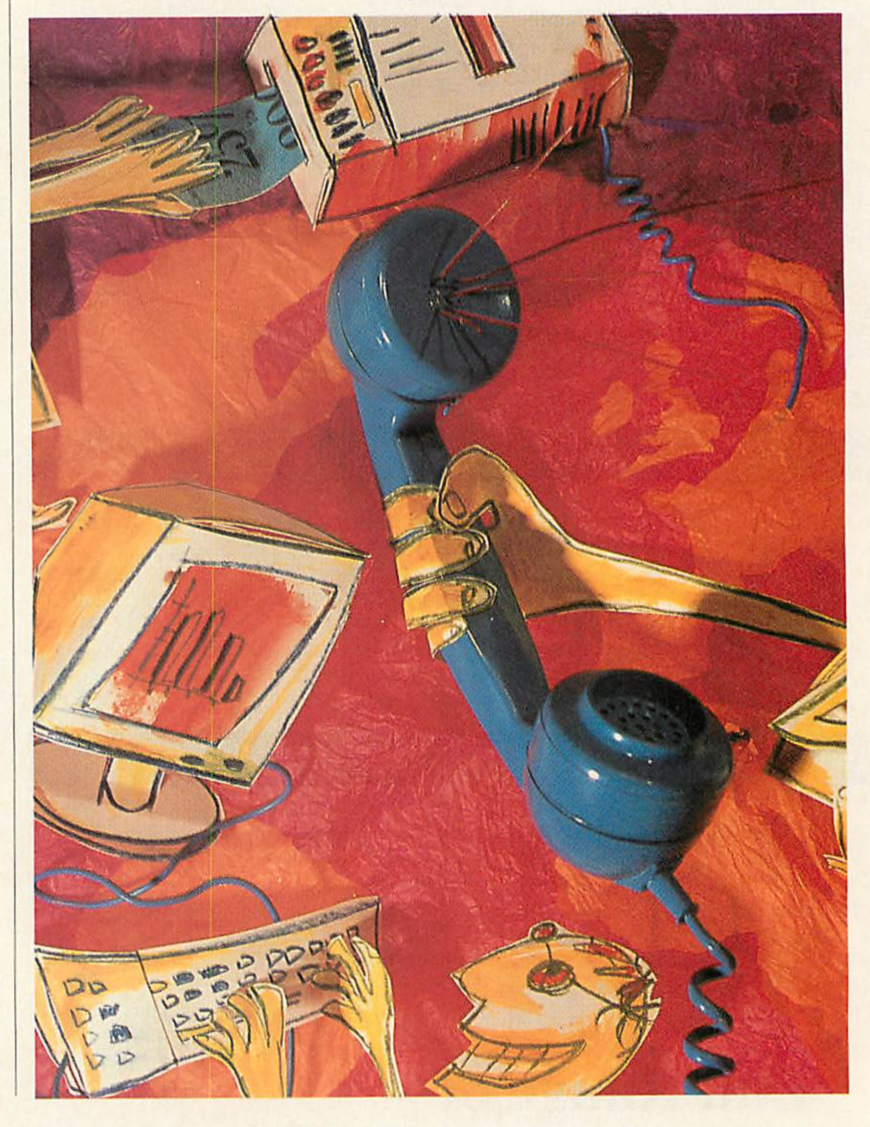


Illustration by Cyrus Deboo

GOING ON-LINE

The world is waiting to communicate with you and your computer. **IAN BURLEY** begins a three-part series showing you how to go on-line

Several host systems and the more complex private BBs offer on-line interactivity, so that you can communicate in real-time with others using the same system. This can range from simple on-line conversations via the keyboard, through to multi-user adventure games and citizens band radio simulators.

Multi-user games (or MUGs) command a cult status with many comms enthusiasts. They can provide a true taste of 'virtual reality', ie, exploring surreal landscapes, finding treasure, etc, as you earn points, but watch out for other players determined to cheat you of your hard earned winnings.

WHAT YOU NEED

There are three basic ingredients necessary to get your Beeb or Archimedes on-line; a modem, a comms or terminal emulation program and, of course, a telephone line.

The term modem is derived from MODulator DEModulator. If you've ever seen a computer equipped for comms you are likely to have seen this device hooked up to the telephone line.

In its simplest form, a modem converts digital data from the computer into tones which can be conveyed by an ordinary telephone line, called signal modulation. The job of a modem is to transmit and receive data. This means the tones sent from a remote modem must be recognised and converted back into digital form for the computer to handle.

Most modems are connected to the computer via a cable to a serial interface (see Jargon Buster). Sometimes the modem isn't a separate box, but a plug-in card – Beebug, for example, produces such a card for the BBC Master 128 and the same company is also developing a sophisticated plug-in modem podule card for the Archimedes.

Trends in modem technology now point to pocket sized modems you can take with you wherever you go. Modern modems are no longer the simple devices they used to be and now incorporate their own microprocessors and a degree of built-in automation. These are known as intelligent, or 'smart', modems and I'll be covering these later in the series.

COMMS SOFTWARE

Your computer will need a program to manage the datalink between modem and computer, as well as to display the information being received on the screen. This is a comms or terminal emulation program. The simplest result would be a continuously scrolling stream of text received from the modem on the screen.

Later in the series I'll be showing how easy it is to write a simple comms program on your Beeb or Archimedes using just a few lines of BBC Basic.

Commercial and even public domain comms programs will offer much more than a simple scrolling text facility. You will normally have a number of options to set regarding modem speed, data format, terminal emulations and file exchange or telesoftware downloading.

It's now usual for auto-dialling to be catered for and some of the latest programs, with the right modem, provide an auto-answer feature to enable remote access of your computer rather as if it was a BB in its own right. This is very useful if you'd like to access files on your Beeb or Archimedes at home – say, from the office or practically anywhere using a portable computer.

The ultimate comms program is a BB system in its own right. Converting your Beeb or Archimedes into a system which could attract hundreds of other callers isn't as difficult as it might sound.

As regards the telephone line, there's not much to be said except that, if you have the old-style BT phone connector which looks rather like a hi-fi jack, or even no removable wall connector at all, it is best to upgrade to the latest spec telephone jack socket.

Unfortunately, some of you still connected to very old exchanges may find that line noise will be a problem at higher modem speeds, but there are several ways around this which I will be exploring later.

Next month, I will be looking in more detail at the technicalities of comms as well as the variety of modems and comms programs available and I will suggest a set-up to get you on-line. You might be surprised that it could cost as little as £20.

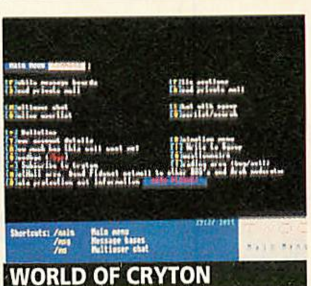
JARGON BUSTER

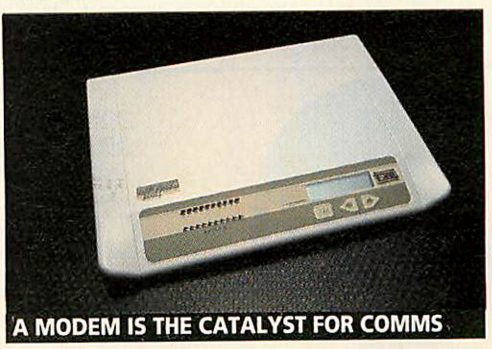
AN AT-A-GLANCE GLOSSARY OF COMMS TERMS

- **SERIAL INTERFACE** A communications port which allows transmission of a stream of data one bit at a time. The hardware standards for serial interfaces are usually referred to as RS232 or RS423. Data words or bytes are separated out in the data stream by start and stop bits and sometimes parity bits
- **MODEM** Modulator-demodulator. The device which translates digital signals from computers at either end of an on-line link into telephone line compatible signals and vice-versa
- **TELESOFTWARE** Programs, text files, sound and picture datafiles, etc, which can be copied from an on-line system by a remote user currently connected or logged onto that system
- **HOST SYSTEM** A computer system offering services which users can log into and utilise
- **VIEWDATA** Colour alpha-mosaic frame-based display standard similar to teletext. Used by host systems based on the Prestel standard
- **BBS** Bulletin Board Service. Dedicated host system, often consisting of a single computer and phone line
- **MUG** Multi-user Game. Adventure games which involve interactivity with a number of players on-line all at once
- **EMAIL/ELECTRONIC MAIL.** Transmission of text messages without using paper
- **AUTO-DIALLING** A facility by which a modem can dial a pre-determined phone number
- **AUTO-ANSWER** A facility whereby a modem can detect the telephone ringing, electronically 'pick up' the receiver and take the call
- **TERMINAL EMULATION** In the old days, terminals were simply converted teletype machines hooked up to large – but, by today's standards, not very powerful – mainframe computers. Over the years, terminals have been developed to include many character sets and graphics capabilities. VDU screens arrived and these are said to emulate their paper-based counterparts
- **DUMB TERMINAL** The simplest form of terminal. All it can do is display text and let you type it in. No other facilities like file exchanging, for example, are provided



MICRONET


WORLD OF CRYTON


A MODEM IS THE CATALYST FOR COMMS

POSTER

An object-based DTP package which allows you to do far more than create posters. In fact there isn't much in the way of DTP design and layout that can't be done with Poster. It's almost an art package. The application is fully RISC OS compliant. It can 'talk' to Edit, Draw and any other RISC OS program. Poster comes with its own set of unusual outline fonts but will allow you to use any RISC OS outline fonts. It also has a huge collection of interesting borders and clip art. Two features place Poster in a different league from other packages. Firstly, you can do wonderful things with text. It can be made to flow along any path or it can be moulded into virtually any shape (as can outline Draw files). Secondly the size of the document is not dependent upon the limitations of your printer. Poster will allow a document of any size to be created (although 100 metres square is not very practical). It then prints the document in sections which can be cut and assembled using the trim marks. Poster documents may be used in other DTP packages.

A&B COMPUTING 1990 ART/DESIGN AWARD WINNER

SNIPPET



A utility which will make you wonder how you ever managed without it. Snippet will allow you to print or save any part of any screen. It will even cope with most programs running under the 65Host BBC Emulator. But Snippet will allow you to do lots more. Sprites may be converted from one mode to another and even 8 bit BBC screens may be easily converted into Archimedes sprites. A vast array of tools allows you to trim sprites, add borders, change colours, use outline fonts to add text, edit pixels, rotate sections and combine any number of sprites to make a single sprite. A carousel allows sprites to be displayed.

ALSO...

JIGSAW — allows sprites of any size to be converted into jigsaws with real jisaw-shaped pieces. It comes complete with a set of pictures including some by the well-known artist Rodney Matthews.

JIGLET — the version for younger users. It has fewer pieces and a more appropriate set of pictures.

CRAFTSHOP 1 and CRAFTSHOP 2 — programs allowing those with limited artistic ability to create some stunning results. Both packages are currently in use in thousands of schools and homes.

THIS BOOK WAS CREATED WITH POSTER

DTP SEEDS

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FONTASIA

DAVE LAWRENCE adds more data to last month's 24-pin font designer program

Just when you thought you'd typed in all the parts of my 24-pin character editor, here is another block of data for an additional font and a conversion program for Clare's *Fontwise* fonts. I will run through these briefly and provide a few hints and tips about designing fonts.

This month's offering is another sans serif font, but much 'lighter' (ie, not as bold). It is entirely of my own design, but has a definite Avant Garde look to it (see figure 1). As with the font published in last month's issue, it is stored in a special compressed form complete with checksums. The decompression routine is exactly the same, so if you still have the *MakeFnt* program from May, simply delete the DATA statements from line 760 onwards, and replace them with the DATA statements from this month's *MakeFnt*. Running the program will create a file called DLlight which can then be loaded into the editor.

FONTWISE CONVERTER

When nine-pin printers were considered the 'bizz', a number of software companies produced NLQ (near letter quality) font packages which doubled the effective resolution of the printer by performing two passes of the print head, but slightly offset. Perhaps the best of these programs was Clare's *Fontwise*, which included a large range of fonts and a designer. If you own a copy of *Fontwise* and a 24-pin printer, you probably know that you can't make use of your extra pins.

If you want to use *Fontwise* fonts then you can use the *ConvFW* program, which takes a *Fontwise* format file, does the necessary grubbling to extract the characters and spits out a file suitable for loading into my editor or downloading to a 24-pin printer. Note that *Fontwise* characters are only 16 pixels wide and 17 pixels high, so you may want to expand them. Alternatively you can produce some very small printouts by making use of the Fixed width and Auto space modes in the editor.

HINTS AND TIPS

I do not claim to be any expert in designing fonts, but I based both fonts created with my editor around fairly simple ideas. This list is neither exhaustive nor technically perfect, so don't complain if it lacks the precise typographic terminology!

First, decide the overall effect you want your font to have: physical size (pixels wide and high); weight (how thick the lines will be) and general appearance (sans serif, freehand, and so on). Second, work out some guidelines on the designing grid. Horizontally, you need:

- A base line for the bottom of upper case characters
- A descender line for the bottom of lower case characters, such as g and y (usually the bottom of the grid)
- A line for the top of upper case characters (usually the top of the grid)
- A line for the top of lower case characters
- A middle line for characters such as B, E and F (this need not be used for A, P and Q)

Vertically, you need:

- A left edge (usually the left of the grid)
- A centre line (for I and T)
- An approximate right edge (note that you don't need, and in fact are unlikely to achieve, a uniform right edge for all the characters. As long as the characters are almost the same width, the font will look fine and you will definitely need more space for an M than for an I

Now you can start designing the characters. I use the 'trees' shown in figure 2 to help design characters. You can base certain definitions on others and this can save a lot of time. I start with the O, as it forms the basis of a lot of other characters – it is also quite tricky to get the curvature exactly as you want it. Don't forget that I could not make the aspect ratio of the editor 'correct'. I then use the tree to copy this to the other characters and tweak them as necessary. I always leave the S, M and W until last as they are usually the hardest to get right.

The tree for lower case is similar, but not exactly the same, so watch out! I usually finish off by doing the numbers and punctuation, again leaving the nastiest (@, ?, ` and, worst of all, &) as long as possible.

One final hint is to practise drawing angled and curved lines and printing out the results – you will soon become proficient in getting the effects you want. Ideally, the editor should let you use Bezier curves, but then this is only a BBC program. Watch out for the enhanced Archimedes version!

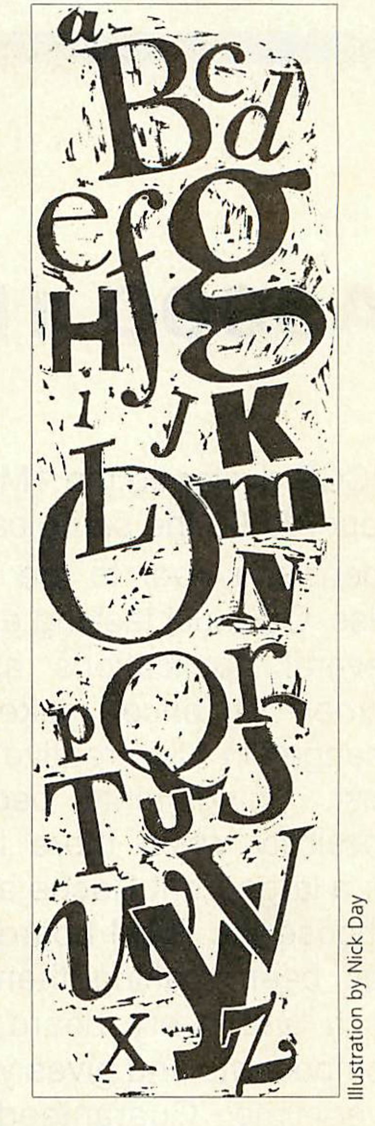


Illustration by Nick Day

FIGURE 1

=FGHIJKL
QRSTUVWX
]^_£abcc
ijklmnop

FIGURE 2

```
O ┬→ Q
  ├→ A
  ├→ U → (V) → (M) → (W)
  └→ C ┬→ G
       └→ D

I ┬→ T → (Y)
  ├→ J
  └→ L

B ┬→ P → R
  ├→ (S)
  ├→ (K)
  └→ E → F → H → N ┬→ X
                   └→ Z

o ┬→ c → e → (s)
  ├→ (a)
  └→ b ┬→ d
       ├→ g → y
       ├→ p → q
       └→ h → n ┬→ r
                ├→ u → (v)
                └→ (m) → (w)

i ┬→ (j)
  ├→ (f) → (t)
  └→ (l) → (k)

x → (z)
```

GET TO GRIPS WITH ADFS

PETER JENNINGS looks at some of the advantages of using the ADFS system

One of the biggest advantages of stepping up from a BBC B to a Master or an Archimedes is the Advanced Disc Filing System, or ADFS. It comes in addition to DFS on the Master, but instead of it on the Arc.

You can treat ADFS exactly as you do DFS, ignoring for the moment any other directories except the main one, which is reassuringly still called $. On the Master, insert a formatted ADFS disc (we'll see later how to format it) and type *ADFS. The only unfamiliar thing you have to do then is to type *MOUNT whenever you insert a different disc. ADFS copies the disc directory into memory and needs to know whenever the disc is changed so that the memory can be updated.

Program names can now be up to 10 characters long, instead of seven, and you can get 47 files in the directory (or 77 on an Archimedes). With a double-sided disc drive, ADFS treats both sides of the disc as if it were a single surface. Instead of the oddly numbered drive 0 and drive 2 of your main, or only, disc drive, it now becomes just disc drive 0 and ADFS sorts out which side to store data.

If you have a second disc drive this becomes drive 1, instead of 1 and 3. You can forget all the awkard 'drive' numbers that DFS uses for the second sides of discs – in fact, ADFS does not use the *DRIVE command at all.

DFS has the irritating drawback of allowing only 31 files (programs) on each side of the disc, regardless of how much unused space there is. ADFS allows as many files as you want until the disc is full because the $ directory allows 47 entries which can either be programs or subdirectories. Another big advantage is that the directories can have meaningful names up to 12 characters long.

You can create some extra directories with the command *CDIR and the new directory name. So, if you have a disc reserved for games, you could now add, say, three additional directories by typing: *CDIR ARCADE, *CDIR ADVENTURES and *CDIR STRATEGY. Any program you want to put into a sub-directory can be saved by typing the directory name with a full stop in front of the program name.

When you mount a disc, go into directory $ and *CAT. This will show all the entries in it, programs and directories (identified by the letter D after their names), but not the contents. You can move into any directory in $ by typing *DIR and the new directory name. While in a directory, any programs can be saved there, or loaded, without a prefix to the directory name.

Each of your new directories has space for another 47 entries, but, if you want more, each entry can again be either a program or a directory.



ADFS MAKES YOUR FILING SO MUCH EASIER

You can create a personalised 'tree' quite easily. From the main $ directory you could move down one directory by typing *DIR LETTERS. You could then go to the directory called Business by typing *DIR BUSINESS and then into Bank with *DIR BANK. Alternatively, you can move between directories by typing the full 'path' between them, separated by stops. So DIR$.LETTERS.BUSINESS.BANK will take you directly from $ to Bank. *BACK takes you back to the last directory you were in.

There is a short cut for switching the Master between DFS and ADFS. As an alternative to typing *ADFS, press CTRL-A and then press BREAK. Returning to DFS can be done by typing *DISC or by holding down COMMAND-D-BREAK. Remember that using the BREAK key system will wipe any program in memory.

Discs have to be formatted for ADFS. If you have a Master, the formatter is a utility on the Welcome disc. Boot the disc (SHIFT-BREAK) to get the Utilities menu. Select 3 to go on to the ADFS utilities menu. Then select 1 to chain Aform which will give you detailed instructions. As with DFS, the disc can be verified afterwards to check it is free from faults.

The Archimedes does not have DFS, so you are using ADFS right from the start, and the formatter is built in. Archimedes discs can have different formats from those used on the Master to give them a bigger capacity (800K) and to allow 77 entries, instead of 47, in a directory.

On machines fitted with Risc OS there is a format E, which is selected by default unless you select one of the alternatives offered.

Archimedes computers without Risc OS normally use format D. Format L is compatible with the Master and should be chosen if you wish to back up Master discs for use on the Arc. However, it provides less space on the disc (640K instead of 800K) and only 47 entries, instead of 77, in each directory.

Finally, a word of warning. If you are using both ADFS and DFS discs it is important to distinguish between them. Trying to use DFS to save a program on an ADFS disc, or using ADFS to save onto a DFS disc will corrupt the disc and lose any programs on it.

PRIME CANDIDATES

Playing around with prime numbers can be intriguing as well as fun. **DR SUSAN STEPNEY** unravels the sums

As the numerate among you will know, a prime number is one which is exactly divisible only by 1 and itself. The Greek mathematician Euclid, who lived over 2000 years ago, offered a simple, and frustrating, proof of an infinite number of primes.

Assume there is a largest prime, P. Form the product of all the primes up to and including P then add 1, giving $(2 \times 3 \times 5 \times 7 \times ... \times P) + 1$. This new number is not divisible by any of these primes (since it will have remainder 1 when divided by any of them). So this number must be either a prime, or be divisible by another prime larger than P. But this contradicts the original assumption, which must therefore be false – there is no largest prime P.

The new record primes often have the form of Mersenne integers (named after the 17th century French mathematician, Marin Mersenne):

$$M_p = 2^p - 1$$

If M_p is prime, then it's easy to show that p is also prime. This is not helpful for finding new primes, since M_p is bigger than p. However, the reverse is not true.

M_2, M_3, M_5, M_7, etc, are prime, but $M_{11} = 2047 = 23 \times 89$, $M_{23} = 8388607 = 47 \times 178481$ and more are composite.

Higher values are prime or composite in no discernible pattern; ones which are prime are called Mersenne primes. Mersenne made some conjectures about which ones are prime, and although many of his guesses were wrong, his work did stimulate interest in these numbers. Although it is not known if there are a finite or infinite number of Mersenne primes, larger ones are being discovered. The biggest known to date is M_{216091}, a monster with over 65,000 digits!

But how can you tell if such an enormous number is prime? Well, the reason Mersenne numbers are studied is that there is a particularly simple test for their primality. First, you have to define the sequence e_k as follows:

$$e_1 = 4$$
$$e_k = e_{k-1}^2 - 2 \text{ for } k>1$$

This gives $e_2 = e_1^2 - 2 = 14$, $e_3 = e_2^2 - 2 = 194$, and so on. Then you can use the Lucas-Lehmer test, which says that M_p is prime if e_{p-1} MOD M_p is zero. So, to test each Mersenne number for primality appears trivial. Just calculate e_p-1 for each M_p (done in the k loop below):

```
p = 1
REPEAT
p = FN_next_prime(p)
Mp = 2^p - 1
ek = 4
FOR k = 2 TO p-1
ek = ek^2 - 2
NEXT k
PRINT "2^";p;"-1 is ";
IF ek MOD Mp = 0 THEN PRINT "prime" ELSE
PRINT
 "composite"
UNTIL FALSE
```

Life is not so easy, however. e_k grows quickly and would soon overflow the four byte integers of BBC Basic. One possibility is to pull the modulus inside the loop (can you prove this is valid?), keeping the new e_k no bigger than M_p^2:

```
FOR k = 2 TO p-1
ek = (ek^2 - 2) MOD Mp
NEXT k
```

You can keep e_k no bigger than M_p by using a doubling and halving algorithm to calculate e^2. See how the variable c ends up holding A*B:

```
a = A : b = B : c = 0
REPEAT
IF b MOD 2 = 1 THEN c = c + a
b = b DIV 2
a = a * 2
UNTIL b = 0
```

It is easy to prove this works, provided $B > 0$. Before entering the loop, the expression $a * b + c = A * B$ is true. It is also true at the end of each loop (check this yourself, try with b odd and with b even). So it will be true when the loop finishes, which is when $b = 0$. So then, finally, $c = A * B$, as required. The loop does terminate; since b is decreased each time round the loop, it will eventually reach zero. This is a standard way of proving a loop is correct.

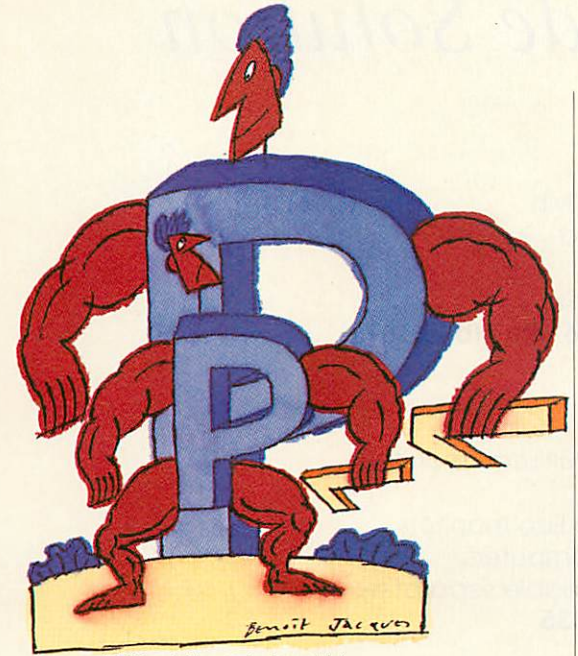
This is the algorithm used to square e. You can also take the modulus each time round the loop to stop the variables e and a getting too big:

```
a = ek : b = ek : ek = 0
REPEAT
IF b MOD 2 = 1 THEN ek = (ek + a) MOD Mp
b = b DIV 2
a = (a * 2) MOD Mp
UNTIL b = 0
ek = (ek - 2) MOD Mp
```

This still does not let you move to very large numbers: four bytes restrict you to $M_p < 2^{4x8}$, or $p < 32$, which isn't very exciting. The monster prime mentioned above would need 27012 byte integer arithmetic! This is too much for a BBC micro (storing ek, the temporary variables a and b, and Mp requires $4 \times 27 = 108$K of memory), although an Archimedes could cope. But smaller primes are accessible.

All that is needed is a way to store and calculate with integers that take much more than four bytes of memory. Strings could be used, but they are restricted to 255 bytes, and string operations are a bit slow. The program below uses areas in memory reserved by the DIM statement and accesses them with the byte indirection operator? If the sequence of bytes in memory is thought of as a sequence of base 256 'digits' making up a number, then the standard pencil-and-paper algorithm for addition can be used (the error handling below is more primitive than it would be in a 'real' program!):

```
DIM a length
DIM b length
DIM c length
REM c = a + b
```



```
PROC_add(c,a,b,length)
LOCAL sum, carry
carry = 0
FOR I% = 0 TO length
sum = a?I% + b?I% + carry
c?I% = sum DIV 256
carry = sum MOD 256
NEXT I%
IF carry > 0 THEN PRINT"overflow":STOP
ENDPROC
```

The other operations needed are: divide and multiply by 2, which can be done as a 'shift right' and 'shift left'; modulus; and subtract 2 modulo M_p, which is equivalent to add M_p-2 modulo M_p.

To halve the number, it is 'shifted right': the low bit of the byte is dropped and, except for the last byte, the low bit of the next byte is glued on to the front to become the new top bit:

byte n+1 byte n
Before: abcdefgh ijklmno
After: zabcdefg hijklmn

The actual algorithm is a bit more complicated, because BBC Basic always executes a FOR loop at least once, which is not what you want if length=0.

```
PROC_halve(a,length)
FOR I%=0 TO length-1
a?I% = a?I% DIV 2 + a?(I%+1) MOD 2 * 128
NEXT I%
a?length = a?length DIV 2
ENDPROC
```

To double the number, it is 'shifted left' in a similar manner:

byte n+1 byte n
Before: abcdefgh ijklmno
After: bcdefghi jklmnop

```
PROC_double(a,length)
IF a?length DIV 128 = 1 THEN PRINT
"overflow":STOP
FOR I%=length TO 1 STEP -1
a?I% = (a?I% * 2) MOD 256 + a?(I%-1) DIV
128
NEXT I%
a?0 = a?0 * 2
ENDPROC
```

Taking the modulus of a general number would be quite tricky. But this case is special, for two reasons: first, the modulus is a Mersenne number, which has a particularly simple base 2 representation, a string of p ones; second, you are careful to take the modulus whenever you increase the size of a number (by adding or doubling), so the number whose modulus you are taking is never bigger than $2M_p$-2. This means we either have to do nothing (if it lies between 0 and Mp-1) or subtract M_p (if it lies between M_p and $2M_p$-1). This is the same as adding one (easy) then subtracting M_p+1 (which means setting bit p to zero).

So Mp can be thought of as ones in bits 0 to p-1. If a is the number having its modulus taken, it can at most have bit p set to one, but no higher bit. So a < Mp if it has bit a(p)=0 and fewer than p bits are set (then it is left alone). Otherwise it is increased by 1, then has the top bit flipped to 0.

```
PROC_mod(a,p)
LOCAL ap, all_bits_set, topbyte, topbit
topbyte = p DIV 8
IF a?topbyte AND 2^(p MOD 8) = 0
THEN topbit = 0:all_bits_set =
FN_all_bits(a,p)
ELSE topbit = 1
IF topbit = 0 AND NOT all_bits_set THEN
ENDPROC
LOCAL sum, carry
carry = 1
FOR I% = 0 TO length
sum = a?I% + carry
a?I% = sum DIV 256
carry = sum MOD 256
NEXT I%
a?topbyte = a?topbyte - 2^(p MOD 8)
ENDPROC
```

Apart from the function FN_all_bits_set, you need the function that returns the next prime. This is done very naively, by dividing all odd numbers up to the square root of the test, until a prime is found. (Note, since the initial value fed to this function is 1, only odd numbers are tested for primality, so it will not say that 2 is prime. Neither will it say 3 is prime, since the first test value it is divided by is 3. But you need not write a program to check if $M_2 = 2^2-1 = 3$ or $M_3 = 2^3 - 1 = 7$ are prime anyway). The complete program is given in the yellow pages, using these fragments, with some minor optimisations.

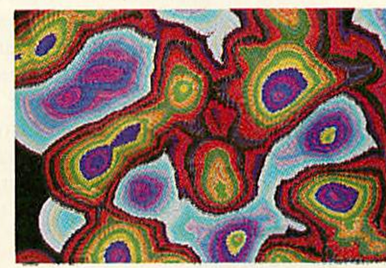
How fast does this run? Can we find a new record Mersenne prime using a Beeb? Well, no. Leave your micro running solidly for a week, and you can easily get up to M_{521}, a prime first discovered in 1952 using one of the most powerful machines then known. Not bad company for a lowly home micro!

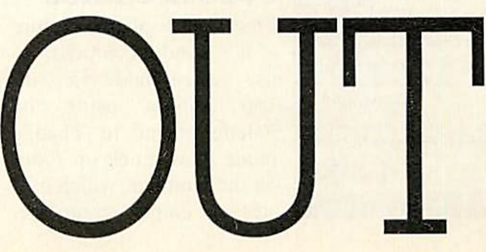
On an Arc it takes three and a quarter hours to check M_{397} (it isn't prime), which means it would take $(216091/397)^3 \times 3.25$ hours, or more than 60,000 years to show that the monster Mersenne number was indeed prime!

Speeding up the processor, implementing the program in a compiled language, or even in assembler, is not going to help. What is needed is a better algorithm that does not increase as fast as p cubed. These faster algorithms, which are much more complicated to program, are the sort used when discovering new records on today's supercomputers. Even so, a university department or a computer club could implement one of these complicated algorithms on a network of micros, leaving it running nights for a year or two, then coming up with a new record.

EUCLID OFFERED A SIMPLE PROOF OF INFINITE PRIMES. BUT ARE PRIMES REALLY THAT SIMPLE?







DAVE LAWRENCE spaces out with some pretty weird designs created with his wacky pattern generator. Go psychedelic and try it out

Gwawp stands for Gosh What A Whacky Pattern and was written one afternoon after getting very annoyed watching some really rather excellent demos on a friend's Amiga. Pah! I thought, I could do that, gizajob! I retreated to my Archie, prodded some Arm code into life, produced a similar effect after an hour or so, christened it *Gwawp* and viola! One psychedelic, colour swirl to watch whilst listening to some mellow Floyd...

Back in the real world, try looking at one of the piccies on this page and imagine the various 'whorls' slowly oozing in and out of themselves while gradually undergoing subtle colour changes. Any luck? No? I didn't think so! You really will have to type in the program to get the full effect!

When *Gwawp* is run, it will ask for the number of circles to plot, it suggests a number less than 1024, but this really isn't important. If you choose a small number, it will plot big circles, whereas a large number will produce small ones. Much above 1000 and they become too small (hence the arbitrary upper limit), much below 30, and they are so large it takes an age to plot them! I suggest an initial value of 99, but please feel free to experiment. The screen is then cleared to mode 13, and the 'circles' are plotted randomly. The 'direction' and 'step' of each circle is also chosen randomly – some increase, some decrease, some are course, some much finer. All this will become clear if you examine the program. The screen is converted to mode 9, and some rather complex palette changing is performed to produce the oozing effect. Pressing ESCAPE will re-run the program and prompt for another number, SHIFT-ESCAPE will exit.

You may notice that the program also offers you the choice of just pressing RETURN instead of entering a number. This allows you to draw your own patterns (with the mouse) which are then colour cycled.

Move the mouse around the screen and press the left button to plot an 'increasing' circle and the right for a 'decreasing' one. The middle button will start the colour cycling. Some very interesting patterns can be produced with this facility, just be careful you don't end up staring at the screen for hours on end!

Although the real effect in the program is produced by juditious use of VDU 19s in Basic, the important pattern generation is performed in machine code. The pattern is created by plotting lots of circles. But instead of each circle being a fixed colour, they increase the colour numbers of the pixels that they cover. Thus, on a blank screen, the first circle will effectively be plotted in colour 1, a second circle slightly overlapping the first will not be uniformly coloured; where it overlaps it will be in colour 2, but in colour 1 elsewhere. The third circle will be plotted in colours 1, 2, 3 depending on how it overlaps the previous two – rather like a Venn diagram. To produce more of a consistent effect, *Gwawp* plots a number of concentric circles (with decreasing radii) in this way.

Unfortunately, even with the large number of extensions to the GCOL command, such an effect is not possible from Basic. I had to dredge out my Arm code Bresenham circle plotting routine from Arc Agora, *BAU* February 1989, make a number of adjustments so it could plot filled circles and also make it read bytes off screen, increase them and poke them back. I also added the necessary code to allow parameters to be passed to the routine from the CALL statement. The resulting code starts at .circle in the listing.

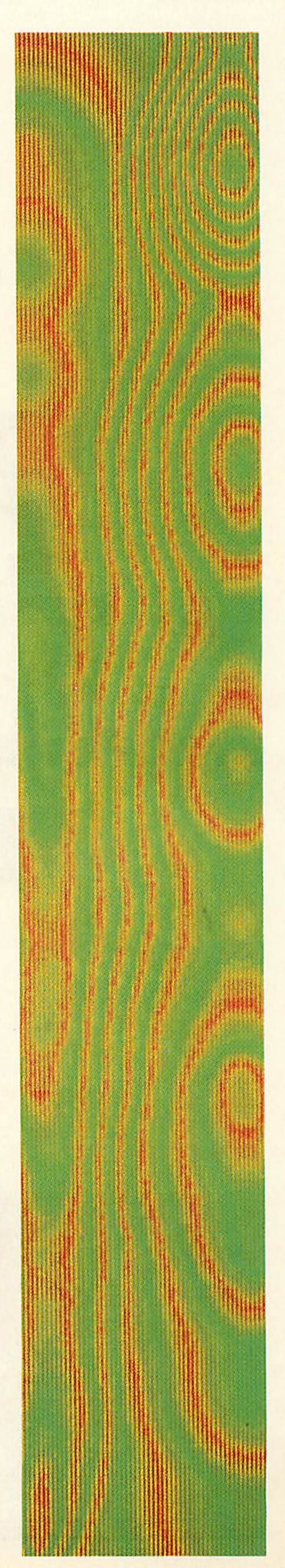
The colour cycling was quite tricky to think about at first, and even now it looks quite complex, but if you follow it through carefully, it's not really that bad. Essentially it starts from a simple grey scale and picks two random RGB values as 'destination' points.

It then slowly mutates the greys into a scale between these two values, all the while cycling the 16 colours on the screen. When the destination values are reached, two new ones are picked and the process repeats.

If you feel a little adventurous, you might like to fiddle with the program to produce some different effects. You could vary the way the circles are plotted, alter their size and number. The 'add' parameter in the CALLcircle command controls what amount is added (or subtracted!) to the bytes on the screen.

Finally, you can change the rate at which the colour palette changes by fiddling with the 'steps' variable in PROCinit9.

That's it then, have fun, and remember, you can never be too outrageous with your creations.





Use your A3000 or Archimedes to produce a label using Draw, Paint and Edit applications

ABLE LABEL

If you've been following our series since the start, you will have learned a fair bit about the individual applications on the BBC A3000/Archimedes. This month's article goes a stage further, with a project which combines the use of *Draw, Edit* and *Paint*.

If you have an A3000 with the standard 1Mb of memory, the scope for using Risc OS' 'multi-tasking' is limited because each application takes up a section of memory, and you haven't quite got enough. With 2Mb or more, you can begin to see real benefits. But even with 1Mb, you can still see another important feature of Archimedes software – the ability to transfer data between one application and another.

This month's project involves producing a small document – in fact, a jam pot label – that has a sprite created with *Paint*, text from *Edit* and other elements from *Draw*. Slip in application disc 1, pop up a filer window and double-click on the *Paint* application.

THE COMPLETE BOBBLE SPRITE

COLOUR CHOICE

First, the raspberry picture – it's subtly coloured, so use screen mode 15 with 256 colours, using the Palette menu to change mode. Now click on *Paint* on the icon bar, which creates an empty sprite file. Press Menu within the new window and choose the Create option to bring up the Create Sprite dialogue box – this is like a form you fill in.

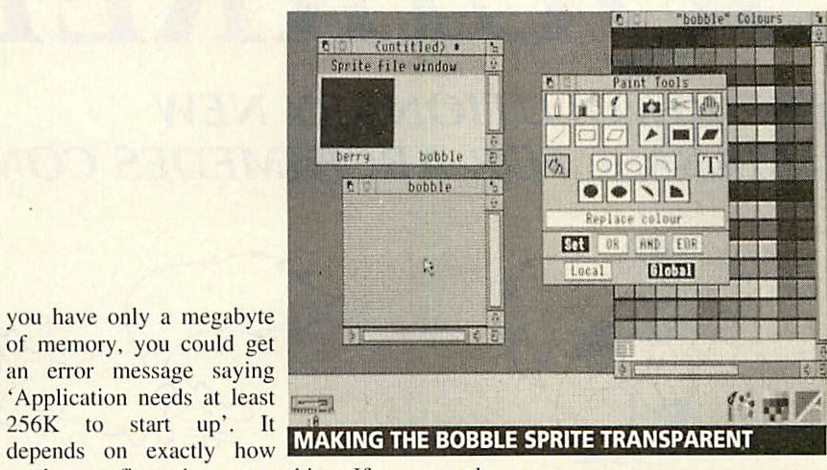
The details for the raspberry are the name 'berry'; size 300 wide by 150 high; mode 15. Make sure the Mask and Palette options remain off, then click on OK.

Once this is set up, don't start drawing immediately – set up a second similar sprite, 40 by 20, called 'bobble', though with this one, use the mouse to click on the Mask option.

You can see the two blank sprites in the sprite file window in 'preview' form. Double-click on the bobble sprite to open its 'editing' window, and use the menu to show the painting tools and colours available. Zoom up to about 4:1 to make drawing easier.

You want this sprite to be round, not square, which is why the mask option is set when creating the sprite. But the whole sprite is currently black – so choose the Fill tool (the spilling paint can), the Global option, and the last colour on the colour selector, the striped grey one at the bottom left. This colour is 'transparent': a single click in the sprite will replace all the black with transparent, as in the picture (top right, opposite). Make sure you turn the Global option off again now, because, like me, you might forget it next time and turn your whole sprite light blue by accident. Now you can pick a nice purple-red colour (I used number 24) and draw a filled circle in the sprite.

Overlay this with successively smaller circles of gradually lighter and brighter reds, each one a


MAKING THE BOBBLE SPRITE TRANSPARENT

little further towards the upper right. I used 17, 20, 21, 22, 23, finishing off with a tiny area of pink (colour 63) as a shiny highlight, to give a three-dimensional effect, like the bottom left picture on previous page.

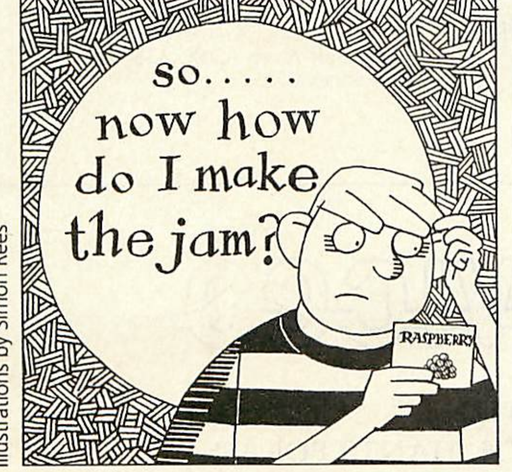
Once the bobble sprite is complete, close its editing window and open the berry sprite. This too is black, so fill it with white (colour 255) in the same way as you filled the bobble with transparent. Now you can use the bobble sprite as a brush – choose the Brush tool, type the name 'Bobble' into the Name box and click on OK. This allows you to paint in a complete bobble with a single mouse click, so try it. If the outline of the raspberry goes a little awry, then rub it all out with a transparent rectangle or something, and start again.

Work from the outside in, overlapping the bobbles more at the outside and less in the middle to give a rounded look to the raspberry.

Once you're happy with your fruit, close its editing window. You don't need the bobble again, so you can delete that sprite – press Menu while pointing at it, then choose Sprite 'Bobble', Delete. Then save the complete sprite file onto a disc – call the file 'Raspberry'. In fact, unless you've got a 1Mb machine, you don't really need to so this, but it is safer to save anyway.

Return to a more normal mode 12 now, using the menu that pops up from the palette icon in the lower right of the screen. The colours of the raspberry sprite won't look as good as on the previous mode 15 screen – the sprite itself remains the same as before, but there are not enough reds available in mode 12-to show it properly. The Arc picks the nearest colour available, and in mode 12 there is only one bright red. Changing screen mode gives you back a little memory, which you may need.

Now open a *Draw* window by double-clicking on the application in a filer window and clicking on its icon when it appears on the icon bar. If



Illustrations by Simon Rees

you have only a megabyte of memory, you could get an error message saying 'Application needs at least 256K to start up'. It depends on exactly how you've configured your machine. If so, cancel the error message, make sure you have saved the sprite file, then quit *Paint* – this frees up enough memory for *Draw*. If you've got 2Mb, then you can leave *Paint* just where it is.

LABEL ELEMENTS

Draw will be used to assemble all the elements of the label – the raspberry sprite, the large text and the small text (the ingredient list for the jam). The label in question is 3.5 × 2.5in, so the first thing to do is show the grid and switch on grid lock – it defaults to quarter-inch markings, so it's just right. Choose the Rectangle tool, and stretch out a rectangle to mark off the edge of the label.

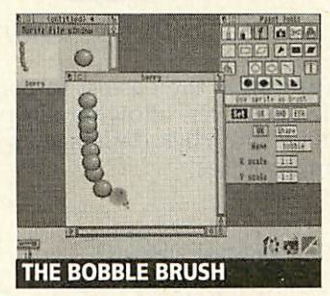
Now to put the raspberry sprite on the label. If you quit *Paint*, you have no choice about how to do it: drag the sprite file from the filer window where you saved it on disc, and drop it into the *Draw* window. It will take a few seconds to load in from disc and will appear, rather larger than you expect, usually a bit further up and to the right, but somewhere near the label. You might have to scroll up a bit to find it!

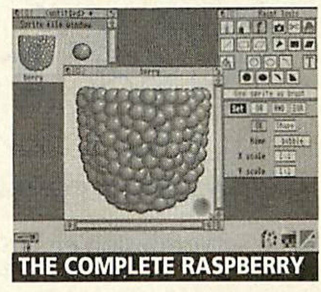
If you didn't have to quit *Paint*, you could do the above, or try 'in-memory transfer'. Rather than save the sprite to disc then load it into *Draw*, transfer it directly from *Paint* to *Draw*. Point at the berry sprite with the mouse pointer and press Menu. Slide the pointer off the edge of the Sprite Berry item to the sub-menu, and slide off Save to reveal the Save dialogue. Now drag the Berry sprite file icon straight across the screen to *Draw* and drop it – it appears in exactly the same way as if you had loaded it from disc, but faster.

With 1Mb, it is still possible to run out of memory when doing this. Don't panic – just make sure you have saved the sprite file, quit *Paint* and drag the sprite in from disc.

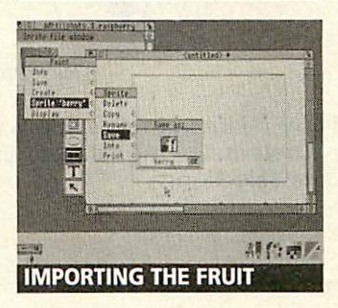
In-memory transfer is quick and convenient – you don't have to save everything (if you are feeling confident), and it removes most of the hassle involved in using three small, convenient packages instead of one huge do-everything application. That is one of the fundamental principles of Risc OS.

Once the berry sprite is in the drawing, you can select it with the Selection tool (the arrow at the bottom of the toolbox). Drag it to somewhere near the middle of the label, then press Menu. Slide off the edge of the Select option, down to Magnify, and type in 0.25 and press


THE BOBBLE BRUSH


THE COMPLETE RASPBERRY

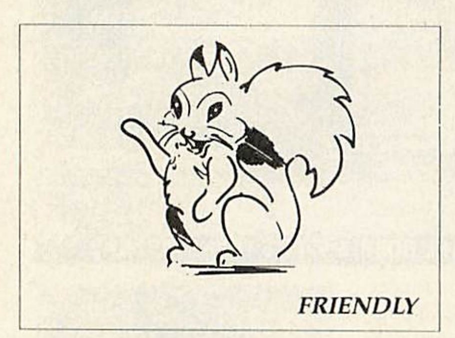

A LABEL OUTLINE


IMPORTING THE FRUIT

SQUIRREL

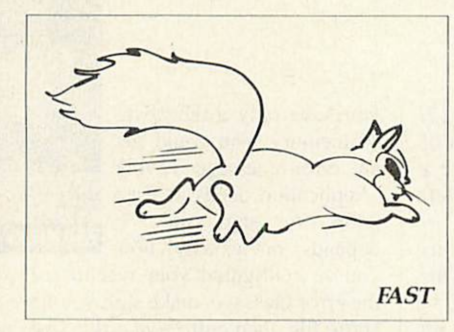


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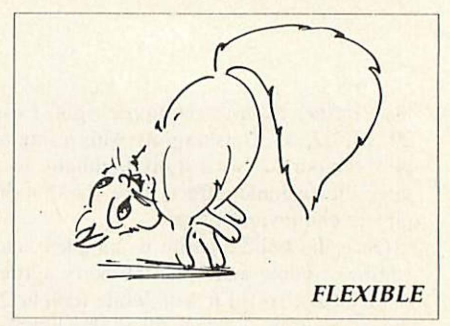
FRIENDLY

Squirrel is the easiest to use database yet, allowing simple point and click database creation and queries.



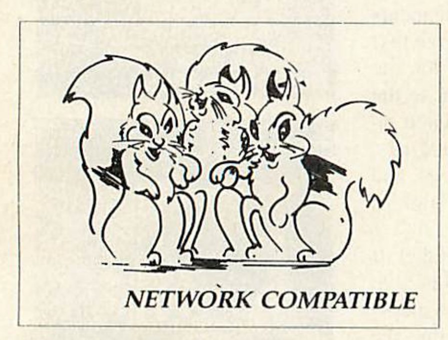
FAST

Modern indexing techniques mean superfast searches every time.



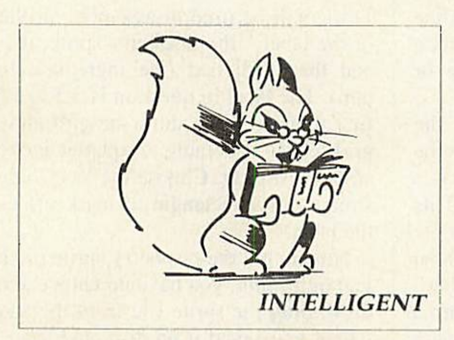
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RETURN – this makes the berry the right sort of size. If you think it's too small now, then use Magnify again and increase the size to 1.1 or whatever.

You might want to unlock the grid, select the berry and drag it into the exact correct position – zoom in to 2:1 if it helps. Lock the grid again afterwards by ensuring there is a tick by the Grid Lock option on the menu.

There are two remaining elements to put on the menu, the brand name of the jam and the ingredient list. The brand name is easy: choose the Text tool (the T) and use the Style item on the menu to pick the typeface and size you want. I used Pembroke at 44 point size, but you might only have a choice of Corpus, Homerton or Trinity if you haven't purchased any extra software. Click the mouse button while pointing where you want the text to go, type in the first line of the brand name and press RETURN. Repeat for the second line, with a couple of spaces between each letter.

It might take a while to draw the text. If so, your font cache is too small, so use the Task Manager to extend the memory bar for the font cache. You can quit *Paint* to give you some memory to play with if you need it.

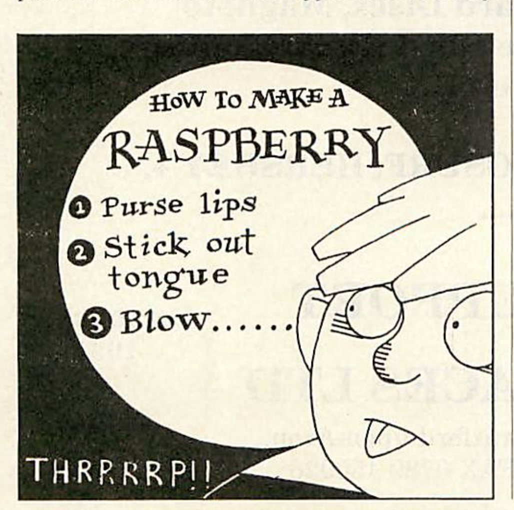
If you have any trouble positioning the text as you want it, then you could unlock the grid.

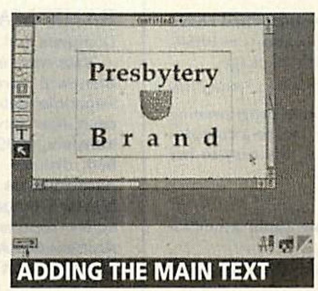
INGREDIENTS

So what about the ingredient list? To create this use *Edit*. Quit *Paint* if you still have it on the icon bar, and load up *Edit* from the applications disc. Even in a 1Mb machine, you should just be able to run *Edit* and *Draw* together.

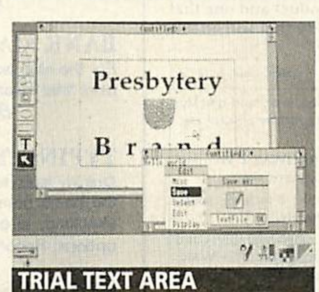
Once *Edit* has installed, pop up an empty *Edit* window and try this. Type in a couple of words, 'Hello world', and press RETURN. You should still have your *Draw* window open showing the nearly-completed label. Using the *Edit* menu, bring up the Save dialogue and drag the *Edit* file icon onto the drawing.

You will see the text appear somewhere in your drawing, although again you might have to scroll around a little to find it. This is multi-tasking and 'in-memory transfer' of data – dragging it directly from *Edit* to *Draw* is just possible on a 1Mb machine, though your machine might ask you to insert a disc half way through the transfer. *Paint* to *Draw* might not be possible because the *Paint* application takes up more memory than *Edit* does.

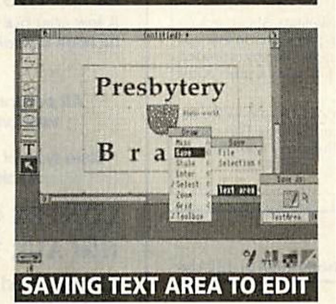




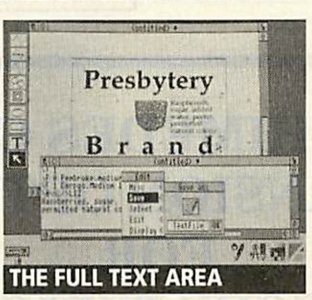
ADDING THE MAIN TEXT



TRIAL TEXT AREA



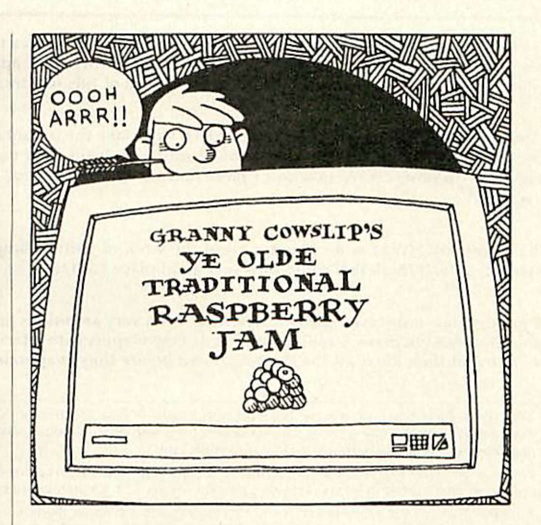
SAVING TEXT AREA TO EDIT



THE FULL TEXT AREA



PRINT IT!



Once you've found the text in the *Draw* window, you can close the *Edit* window containing the original text. Now select the text on the label with the Arrow tool, press Menu and slide off the side of the Save item. At the bottom of the sub-menu, the Save Text Area option appears. Use this and drag the file icon back to *Edit* on the icon bar.

Here's the important bit. *Draw* has automatically added something to your 'Hello world'. What is it? It is *Draw*'s way of specifying how big and in what typeface your test area will appear in the drawing. You can see that there's not that much to it in this example: it specifies two fonts (F0 and F1) and says they are both 12 point size.

Leaving most of that stuff alone, you can add the ingredient list text instead of 'Hello world'. Make sure you leave the last line of the text blank or else it won't work, and it might look better if you change the '\AD' in the preamble to '\AL'. Once the text is right, and making sure the text area is still selected in *Draw*, you can re-save the new text from *Edit* to *Draw* – and it will replace the original 'Hello world'.

Now you can neatly arrange the text area on the label by dragging it, and by using the lower right ear you can alter the shape of the text. Switch the Grid Lock off to make this easier.

The second text area (on the right of the label) can be added in exactly the same way – be careful though, the right one is selected when you're importing the edited text back into the drawing.

In fact, if you check the Risc OS manual supplied with your A3000 or Archimedes, you will see that you can control lots of other aspects of the text area – size and colour of the type, its spacing and alignment, and you can include line breaks and so on. You don't need to stick to the Trinity typeface that *Draw* chooses for itself – if you've bought others for your system, then you can choose them on the finished label.

Now save the label on disc, quit *Edit*, load up a printer driver and print! It may take a while, but it looks better than the scribbled 'Rasp 1991' you usually see. You have now used all the techniques that you need to create newspaper pages, posters or just business letters with an attractive company logo – all good DTP (desk-top publishing) techniques.

PUT SOME COLOUR BACK...

Results — 1990					
	January	February	March		
J Smith	75	70	55		
S Bowes	65	60	61		
A Williams	80	78	71		
S Watson	55	66	55		
R Wyatt	68	63	56		
AVERAGE	69	67	60	67	6
				Overall Average	6

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Illustration by Mike Mosedale

If you are interested in simulated evolution involving 'organisms' and their 'food', then **T K BOYD's** program is for you



The idea behind the *Gobble* simulation came from the Computer Recreations column in the *Scientific American* magazine. Designed to run on an Archimedes, with 1Mb of memory, the simulation is similar to a cellular automaton (CA) – John Conway's *Life* is a well known example and *The Turing Machine* is perhaps the earliest. Patterns of extraordinary beauty and complexity, often very like natural phenomena, can be generated from CAs of remarkably simple design.

On running the program, you will see some small squares moving around the screen which represent protozoans, called 'bugs' for simplicity. There are also many small red dots which represent 'bacteria' – the food for the protozoans – which do not move, reproduce or die, except when eaten.

Each individual bug has its own age, energy reserves and movement genes. Age is important because young bugs cannot reproduce, while energy reserves are significant because hungry bugs cannot move, and very hungry bugs die from starvation. Furthermore, even if a bug is old enough, it cannot reproduce if its energy reserves are too low.

For each tick of the simulation's 'clock', every healthy bug moves in one of six directions relating to the bug's previous movements: forward, backward, hard left, slightly left, hard right and slightly right. Because of their 'genes', some bugs usually go forward, others move like drunks, others tend to go around in a circle.

Each bug has its own set of genes and there is a gene for each direction. The direction a bug moves is determined by throwing a 'die', weighted according to its genes.

If a bug is old enough and healthy enough, you will see it split into two bugs. Each 'daughter' bug is given age 0 and energy reserves equal to a share of the parent's.

One daughter inherits the parent's genes, the other has a mutated set of genes. The chance of movement in one direction increases, but the chances of movement in the other directions are reduced accordingly.

If Charles Darwin was right, the 'average' gene composition of the population will adjust as time goes by – gene sets that help a bug survive are propogated, while unhealthy gene sets (ie, ones that caused a bug to spin endlessly on one spot, which means missing new food in the neighbourhood) cause bugs to die, and thus not leave descendants.



To digress for a moment, an extension of the program would be to arrange for each bug to have two sets of genes, one which was obeyed when food was plentiful, and a second that was obeyed in times of famine. The results would be most interesting for worlds where food is not distributed uniformly.

The real fun begins though when you tamper with 'nature'. What about bugs that reproduce when younger? What happens if the food is generated according to a different pattern? The remainder of this article should help you reprogram the simulation.

I hope you enjoy watching the simulation. Think about what is taking place as you watch the bugs skitter across the screen – not only is it fascinating to observe, it is a testament to the Arc's speed!



INNER WORKINGS

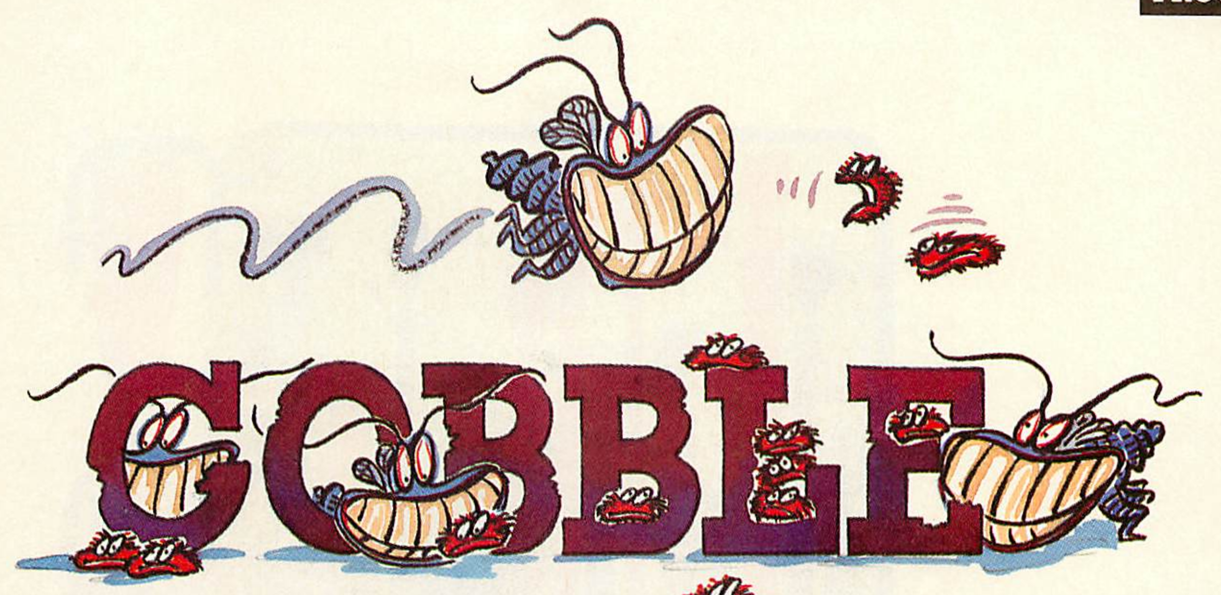
Line numbers have been chosen to emphasise the program's structure. Lines 10-50 are introductory REMS. Line 70 calls PROCmain. This allows me to put speed critical PROCs early in the program.

Lines 1960-2730 are for things that happen only once. In 1960-2160, non-array constants and initial values are assigned, while lines 2180-2270 should be left alone – they set up arrays, depending upon constants set in lines 1960-2730. Lines 2290-2670 initialise other arrays.

Finally in the 'once only' section, a call to PROCdisplay sets up the world as of day one. Food is sprinkled about by PROCnewfood(<Amt>, <DistributionPattern>). The first parameter determines the amount of food generated – it needs to be quite high in the 6000 block, but lower when called at 2830 (new food for a single day). The second parameter determines the distribution of the food generated and should always be KFG.

PROCplotbugs should be left alone, since it puts the current bugs on the screen, according to all that has gone before. PROCplotbugs is long and tedious, primarily because each bug is a three by three group of pixels, and the world 'wraps around', ie, if a bug, or part of one, goes off an edge, it comes back on the opposite edge.

Lines 2750-2860 are the heart of the program, but the only thing you should consider changing here is the first parameter of PROCnewfood, which



determines how much food is made.

PROCelimold gets rid of the remains of the oldest trace of a bug's progress, while PROCrotatcol rotates the colour assignments and this allows an impression of movement without extensive re-plotting.

PROCmainengine takes care of feeding, starving, moving, reproducing and so on (see below). PROCplotbugs puts the newly calculated population of bugs on the screen.

deadbugs becomes true if any bugs die in this cycle (it leads to a need for tiresome adjustments). Most of mainengine is a loop which is executed once for each bug and new positions are calculated and stored in the X and Y arrays. A new direction is chosen according to the bug's genes.

In line 530 and 540, FNpnt determines whether there is food where a bug will be landing. If there is, the first bug to land there 'eats' the food. Line 540, fer(bug)=fer(bug)-1:, is a bug using up energy reserves by living, moving, etc. Of course when this reaches zero the bug will die.

Lines 590-610 check various reasons for skipping reproduction, while lines 620-690 accomplish reproduction, if appropriate. Tamper with PROCmutate if you want different mutations to occur, but only one daughter mutates. This is necessary to simulate evolution – successful gene patterns should be allowed to persist.

DATA STRUCTURE

The variables used as constants and their contents should not be changed once set.

mmax If this is set to 5, movement is allowed in six directions. If altered, the 'move direction' matrix data statements should be altered.

kg1 The maximum valid value in gene array (see below). Prefix k for constant, while a c prefix generally indicates short-term-use variables and counters (eg, c1).

KFG Determines the food generation rule to be used. The valid values are currently 0 and 1. See DEF PROCnewfood (lines 1680 to 1820) if you want to implement a new rule.

nbmax The maximum number of bugs possible. Too large a number results in various arrays taking too much space.

fvr The food value a bug must have to reproduce (there is an array, fer (Food Energy Reserves), with an element for each bug. fer(<bug>) is increased by feeding, decreased by living, or checked to see if a bug is hungry.

fvs The food value after which the bug becomes still.

fvmax The food value maximum. No bug's fer(<bug>) will go above fvmax, and this could be set to a huge value.

fvf The food value of a bit of food. Tweaking this affects the simulation rapidly. Increase it, and starvation becomes less likely. Sufficient reserves for reproduction are also aquired more easily. This is a good example of how most objectives can be achieved by a variety of means. Reproduction can also be encouraged by reducing FVR and AR.

AR The age at which a bug can reproduce.


BUGGED!

VARIABLES

pcp Pointer to the current population of bugs.

ppp Pointer to the previous population of bugs.

nb The number of bugs alive at present.

The arrays X and Y are used in a slightly complicated manner to achieve high speed and to minimise variable storage space requirements. They hold the position of the bugs, and of the 'footprints' of the bugs.

age(<bug>) The ags of the bugs – age(0) is the age of bug 0, Age(1) is the age of bug 1, and so on.

fer(<bug>) The food energy reserves of the bugs.

d(<bug>) The direction the bug is moving.

g(<direction>,<bug>) is not handled as suggested in Scientific American. For bug 0, g(0,0), g(1,0), g(2,0), g(3,0), g(4,0) and g(5,0) are its movement genes. (g(5,0) is the last element of g(0,x) when mmax=5, allowing six directions of travel!) Each number is larger than the last, and all are >0 but < kg1. If they were 10, 20, 30, 40, 50, 60, then the first five directions of travel would have likelihoods of 10/kg1 and the last direction would have a likelihood of (kg1-60)/kg1.

Leave line 2220 alone (NB(0)=NB). If you want to alter the initial number of bugs, change line 2090.

The elements of ca(x) and ct(x) affect the colours of the simulation. Try altering the data statement at 2500 if you are feeling brave! I have avoided replotting images of bugs when the clock ticks by using VDU 19 to change the actual colour of logical colours.

mx(<direction>) and my(<direction>) are constants concerned with the relative displacement of a bug for a move of any particular direction.



COMMON

Following the recent national census, **CHRIS DRAGE** discovers ways of using such a resource in the classroom

For most children the national census is a once-in-a-school-lifetime event which offers opportunities for a great deal of cross-curricular work, much of which is very pertinent to National Curriculum requirements.

Superficially, the census conjures up visions of lots of dry statistics which are quickly forgotten. However, this is far from the case as there is a wealth of historical, geographical, mathematical and scientific information which reveals itself through the analysis of census data.

For educational purposes, it is unfortunate that the data must remain secure and inaccessible for 100 years as the records for the periods spanning pupils' grandparents and great grandparents could be a rich source of historical information.

IT can play a major role – with the computer and suitable database management software, the time spent sorting and searching information is greatly reduced. This should mean that more attention can be devoted to what really matters – interrogating and interpreting the information.

As the census only takes place every 10 years, it is easily forgotten and frequently misunderstood. Few people seem to understand how the census is conducted, or why it is important. For these reasons, the Census Office has commissioned a resources pack to help children at key stage 2 to understand more about the census. It has been devised to help children achieve National Curriculum attainment targets in English, maths, technology, history and geography.

The pack consists of teachers' guidelines, eight activity sub-topics, worksheets and background material. It encourages children to design and conduct their own mini-census, including an analysis of the results. The pack includes a census timechart going back to 1801, which, with the exception of a few photographs, is blank, waiting for children to complete the appropriate details. This may be used by the whole class, either to fill in freely, or in connection with a possible theme – for example, the growth of household appliances.

Although the pack is self-supporting, additional resources are suggested – for example, the use of Ordinance Survey maps. IT alternatives to the chart are offered by Northern Micromedia's *Lifeline*, ESM's *Time Traveller* and *Time Lines* from Soft Teach.

Ideally, the pack should be used by groups of pupils, although there is scope for both whole-class or individual approaches. The pack could be used to very good effect at key stage 3, but secondary schools have not been included in the free mailing, presumably due to cost, so secondary teachers may have to resort to scrounging from their local primary feeders.

This is a shame, because the work is very appropriate to 12 to 13-year-olds, with additional scope for use with GCSE courses in the core subjects, including social studies and economics. It would also be appropriate for statistics courses at any level.

The work should be well underway by the time you read this and the children participating should be feeling that they are part of an historical event. If you are not actively involved, you may feel that to start work now or in the near future would be inappropriate as it is not current.

CENSUS

However, the national census provides a useful opportunity to encourage children to collect information about themselves and their families.

Designed by Des Thomas and marketed by Northern Micromedia, *School Census* is a comprehensive resource pack which aims to help pupils at key stages 2 and 3 to conduct and analyse their own mini-census. Des has had experience conducting similar studies 'manually', without computer assistance, and fully appreciates the benefits of taking an IT approach to the subject.

The pack is available in DFS, ADFS and Archimedes ADFS datafile formats for *Key, Key 128* and *Key Plus*. As well as the software, there is a range of support materials which include questionnaires, charts and *Touch Explorer Plus* overlays which concentrate on social conditions from selected past census years.

The five template datafiles include Homes, Family, Work, Leisure and Health. Before any work can commence you are well advised to back up the datafiles.

A very pleasing touch is that the questionnaires are not only provided in printed form for photocopying but also stored in *Interword* text files on disc so that they may be loaded into *View*, *Interword* or *Wordwise Plus* for alteration and editing.

The Archimedes version provides three choices of format: *Impression 2, Acorn DTP* and text files for importing into virtually anything else. The two desktop published questionnaires allow considerable time savings to be made as they are 'finished' documents requiring only the necessary modifications and printing out.

School Census is not prescriptive and the organisation and content is left up to the teacher.

One possibility is to encourage as many classes as possible to participate and for each pupil to take home a questionnaire to complete. Personal involvement often means better returns! Alternatively, a random sample could be taken throughout the whole school.

Another option would be to encourage several generations of the childrens' families to participate. Grandparents and great grandparents could be asked to answer the questionnaire as if they were living 40 years ago. Although the replies may not always be reliable, they would certainly offer interesting comparisons with today's data.

A very important factor to consider before you embark on any task involving computer datafiling in the classroom is the size of the sample and how groups of pupils will actually enter the data. For primary school children there is little point in completing large numbers of questionnaires as there are definite limits on the amount of data they can realistically handle. Similarly, it is important to remember that the main purpose of the project is not to spend hours typing in information but to ask questions, interrogate and analyse and present data.

The handbook accompanying the *School Census* pack leads you through the processes of modifying the datafile formats, entering data and analysis and presentation. It really makes the task quite painless.

When it comes to using the information, the handbook suggests that you let children search through the questionnaires manually for specific information which they must then manually present with a graph. They will soon be convinced of the value of using a computer!

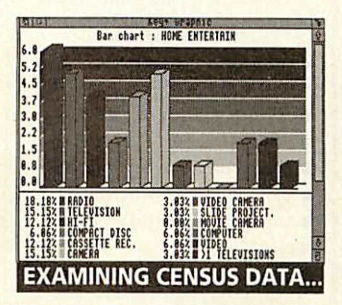
As many of the database fields have been tokenised, it presents practical opportunities for younger pupils to create bar charts and pie charts for interrogation. However, this can be a disadvantage for older pupils as tokenised fields render the statistics option null and void.

One of the great strengths of the *Key* system is that it permits searching of files in three different ways. With a simple search you can find out how many houses were built before 1800. With a complex search pupils add 'and are built of stone'. Finally, there are the OR or EOR options, for example 'how many mums or dads earn more than £20,000?'

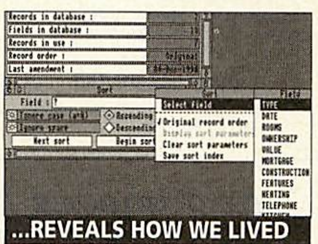
If you are fortunate to have access to an Archimedes then I recommend that you obtain the Risc OS version of *School Census*. Although you may find the approach new and unfamiliar, the gains in utility and speed are substantial and make options like map plotting so much easier that they are a realistic and worthwhile extension to datahandling.

If you have access to census material you may want to include *Key Census* from Northern Micromedia for the BBC B and Master 128, which is a medium for interrogating and analysing original records. The principal attribute of this exercise lies in the fact that the information relates to real people living in the area over 100 years ago. But beware – extracting meaningful information from original census sheets can be a very laborious process. Several other software publishers offer census datafiles for their database management software. For example, the Advisory Unit has several datafiles for *Quest* and *Archimedes Quest*.

Participating in a mini-census using their own collected data is a very worthwhile experience for children as they are able to identify with real people who lived, or are living, in their specific locality. *School Census*, combined with the School Census Information Pack, integrates very well with the National Curriculum, providing an ideal vehicle for datahandling activities.



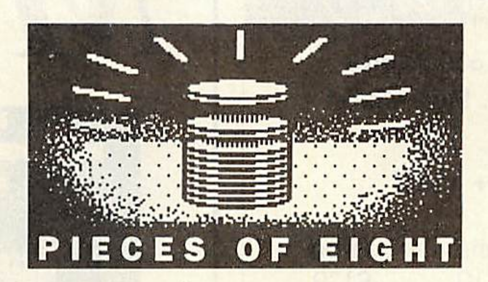
EXAMINING CENSUS DATA...



...REVEALS HOW WE LIVED

SUPPLIERS

- **School Census Information Pack is available from Census Publicity Unit, Office of Population Censuses and Surveys, 10 Kingsway, London WC2B 6JP.**
- **School Census is available from Northern Micromedia, Resources Centre, Coach Lane Campus, Coach Lane, Newcastle upon Tyne. Price: £22.**



THE GAME OF LIFE

We continue our series of classic programs for the Beeb with **PETE ACES** reflecting on the true meaning of Life

Delving deep into the back issues this month, I ran across these two rather good graphical ditties. The first is a version of Conway's now positively infamous game of *Life*. The first BBC version was seen in *BAU* back in January 1984, although this particular incarnation appeared two months later in March and was written by **Malcolm Banthorpe**. I think you'll agree he has well and truly added a new dimension to *Life*!

The program presented here attempts to expand the 'world' of the cells into three-dimensional patterns. It should also demonstrate that 3D computer graphics are not necessarily much more difficult to program than two-dimensional ones. The screen display will be a two-dimensional projection showing the arrangement of the cell patterns in 3D space.

The world in which the cells exist will be a 15 × 15 × 15 cubic grid or matrix, giving 3375 possible locations. The future state of any empty location will be determined by the states of some or all of the 26 locations which immediately border it. Obviously, the original rules of *Life* can't be directly applied to this new three-dimensional structure, but instead subtly modified versions will be used. These have been chosen to provide sequences of patterns which, when applied to most initial cell groups, will generally (though not always) steadily increase in overall size from generation to generation. The rules implemented are:

- Each cell survives for exactly three generations and then vanishes
- Only the eight 'corner touching' cells are taken into account
- Any empty location with exactly one neighbour will give birth to a new cell

For the purpose of the third rule, only first and second generation cells are included in the count. By not including third generation cells, which are about to vanish in the next generation, the amount of array space required by the program is halved, permitting a larger maximum grid size.

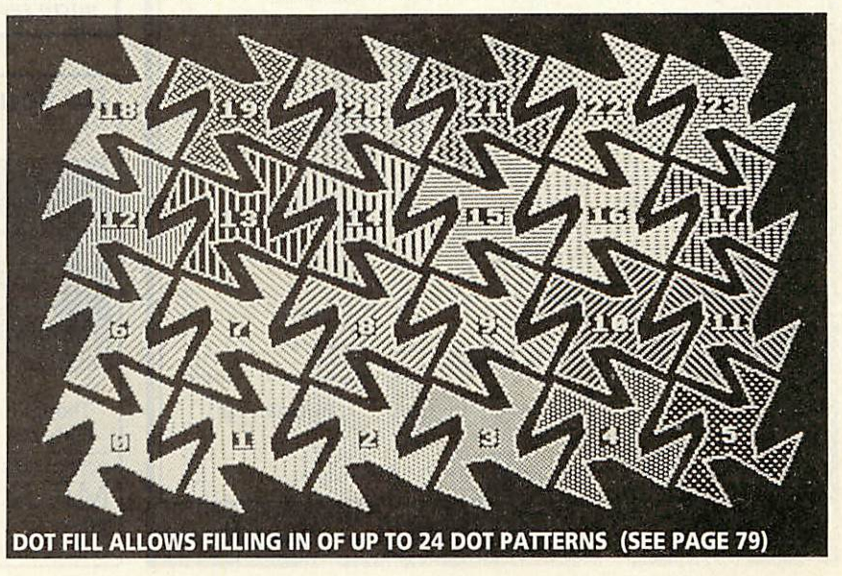
Mode 1 is used to display the results so that a different logical colour can be assigned to each new generation. The colour of an individual cell does not change as it progresses from first to third generation but, at any time, the three generations will be of different colours.

Once a cell is created, it remains the same colour throughout the three stages of its life. Cubes are chosen to represent the cells as they conveniently fit into the grid structure and are simple to represent in two dimensions. There is no reason why spheres, pyramids or stellated dodecahedrons should not be used.

Two elementary forms of hidden surface removal have been employed to make the display as unambiguous as possible. It can be safely predicted that no more than three surfaces of any cube will be visible from any viewpoint. As the cubes are always drawn in the same orientation, you can predict which three surfaces will face the viewpoint – the other three are omitted. The problem of cubes being partly or wholly obscured by nearer cubes is solved by plotting each generation from the furthest cube, the next furthest, and so on.

As each facet is plotted as a solid block of colour, it erases anything already plotted in the same screen position.

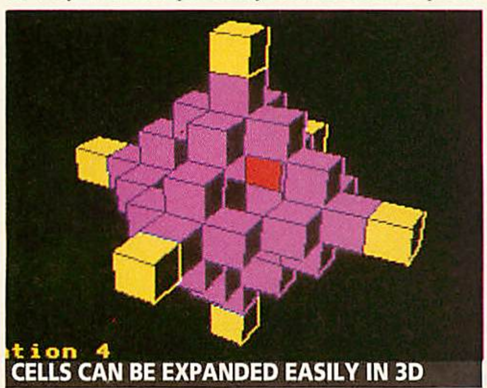
A 15 × 15 × 15 grid was chosen as the largest that can conveniently be accommodated within



DOT FILL ALLOWS FILLING IN OF UP TO 24 DOT PATTERNS (SEE PAGE 79)

the program and still leave enough memory for mode 1. A normal integer array of this size, using four bytes per element, would take up more memory than is available. One byte per element is more than adequate although somewhat wasteful, a single-byte array is easily set up and manipulated to be addressable as a three-dimensional array.

For those wishing to experiment with larger grids, there are two possibilities; first, use mode 5, although halving the resolution, this will release another 10K for array storage. Second, as only two bits per array element are required



CELLS CAN BE EXPANDED EASILY IN 3D

to store the values 0, 1, 2 and 3, more complex definitions of FNread and PROCwrite could be written to permit more efficient memory usage.

Another way of altering the program is to alter the rules that control the birth and death of cells. For example, the following rules can be implemented by making the changes shown in listing 2:

- As before, each cell survives for three generations only
- Only the six 'face touching' cells are considered
- An empty location with an odd number of neighbours gives birth to a new cell

Archimedes and A3000 owners may also like to try typing this program – apart from the obvious speed increases, you can try running it in mode 12 or mode 20 (on a multisync) which produces some very impressive displays!

DOTFILL AND COLFILL

The second feature this month comes from **Peter Sandford**, and was first published in January 1985. He had read the article by Jim McGregor and Alan Watts on colour filling in the September 1983 issue and had written some fastly improved machine code routines.

One routine allowed filling in one of 24 dot patterns and the other in one of 28 colour patterns (in mode 1). In the original article, the source code was presented as a listing to assemble DotFill, and a list of changes to make to assemble ColFill. This was not really ideal, so on the yellow pages you'll find one listing only that asks which routine you wish to assemble – press D for DotFill or C for ColFill!

Existing (remember, we're talking from 1985 here! – *Ed*) fill algorithms assume that the fill will be in solid foreground colour. This enables the algorithm to 'check back' on lines which have just been filled in order to explore the boundaries of the fill region. This technique isn't feasible where the fill routine is to leave certain pixels in their background colour, and a more complex algorithm has to be used. The routine still uses a line queuing technique to cope with convoluted shapes, but it only fills in one direction at a time. As the fill progresses, the limits of each line are tested to see if filling should take place from any new points. If so, the new points are stored in the queue to await completion of the current direction of fill.

The code for this algorithm occupies just under three pages of memory. One additional page is required for use as workspace for the queuing of new points and must be specified at the time of assembly. This, and the start of the code, can be altered by changing the appropriate variable in PROCinit. You could even move both areas into sideways Ram.

(Note that if you do change either address, you'll have to remove the checksum calculation as it will no longer be correct).

After assembly, the routine can be used from Basic by the command:

CALL dotfill,x%,y%,t% (or) CALL colfill,x%,y%,c%

where x% and Y% are the start co-ordinates for the fill and t% is the fill pattern between 0 and 23 (see figure on page 77). The value of dotfill should be set to the start of the machine code.

The colour filling works in a similar way, except for c% which is the colour pattern between 0 and 23 (see right). The selection of tones is by no means exhaustive, and you can easily alter the patterns to suit your own purposes. Each one is based on a 4 × 4 grid and encoded into two bytes. You could even alter the code so that t% was set to the dot pattern itself, rather than using the preset table. DotFill will work in any graphics mode, and the dot pattern is drawn in the current graphics foreground colour.

COLFILL OFFERS UP TO 28 COLOUR FILL PATTERNS

The patterns in ColFill are based on a 2 × 2 'super-pixel' and encoded into just one-byte. Again, the list is not 'complete' and new patterns can be very simply added.

The two figures on this page were generated by *DotDemo* and *ColDemo*, which can also be found on the yellow pages. These should give you an idea as to what effects can be achieved with these routines.

PRINTER QUICKY

Finally, a quicky from **Graham Parry** of Keerbergen, Belgium. Graham's list of VDU codes will set an Epson LX80 (or compatible) into condensed, elite, subscript mode and gives hundreds of characters on a line.

Graham also alters line spacing to bring the lines closer together. Italics and double width work as normal, but superscript, subscript and underlining will not. If anyone has managed to get smaller text out of their dot-matrix, we'd like to hear about it!

3D IS AS SIMPLE AS 2D

!!!!!!!!!!!!!!

ATTENTION

ALL BEEB USERS!

If you use an eight-bit BBC B or Master, then this Pieces of Eight series is for you. Every month we plunder the BAU archives for popular programs which regular readers might have missed, or newer readers might like to try for the first time. If there are any topics you would like to see featured, please let us know. Write to the usual editorial address.



Program	Page	BBC B	B+/128	Master	Master Compact	Electron	Arc	6502SP Turbo	ADFS	Econet	Shadow Ram	Monthly Disc
Risc Revue	26						■					■
Eight Bits	49											
Listing 1		■							■	■	■	■
Listing 2				■	■				■	■	■	■
Listing 3				■	■				■	■	■	■
Listing 4		■	■	■	■	■		■	■	■	■	■
Listing 5		■	■	■	■	■	■	■	■	■	■	■
Listing 6		■	■	■	■	■	■	■	■	■	■	■
Listing 7		■	■	■	■	■	■	■	■	■	■	■
Fonts	59											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Listing 2		■	■	■	■	■	■	■	■	■	■	■
Prime Numbers	62											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Gwawp	65											
Listing 1							■					■
Gobble	72						■					■
Pieces of 8	77											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Listing 2		■	■	■	■	■	■	■	■	■	■	■
Listing 3		■	■	■	■	■		■	■	■	■	■
Listing 4		■	■	■	■	■		■	■	■	■	■
Listing 5		■	■	■	■	■		■	■	■	■	■
Listing 6		■	■	■	■	■	■	■	■	■	■	■

Risc Revue

Listing 1

```
10 REM >Herding (RR1)
20 REM by Bryan Creer
30 REM for Archimedes only
40 REM (c) BAU June 1991
50 :
60 ON ERROR MODE 12:PRINT REPORT$" at line ";ERL:END
70 MODE 13
80 MODE 9
90 COLOUR 2,0,128,0
100 COLOUR 130
110 VDU 19,0,24,0,64,0
120 OFF
130 *POINTER 1
140 ORIGIN 640,512
150 PROCflockdata
160 MOUSE xold%,yold%,z%
170 :
180 REPEAT
190 PROCscreen
200 PROCaction
210 PROCprint
220 UNTIL z%<>0
230 MODE 0
240 END
250 :
260 DEF PROCflockdata
270 sp%=1
280 sr%=24
290 n%=9
300 s%=1
310 DIM x(n%),y(n%),d%(n%)
320 DIM herding%(n%)
330 FOR c%=0 TO n%
340 x(c%)=RND(1000)-500
350 y(c%)=RND(800)-400
360 d%(c%)=RND(360)
370 NEXT
380 ENDPROC
390 :
400 DEF PROCscreen
410 SYS "OS_Byte",113,s%
420 s%=s% EOR 3
430 WAIT
440 SYS "OS_Byte",112,s%
450 CLS
460 GCOL 7
470 ENDPROC
480 :
490 DEF PROCaction
500 MOUSE x%,y%,z%
510 IF x%=xold% AND y%=yold% THEN
520 dogmoving%=FALSE
530 ELSE
540 dogmoving%=TRUE
550 ENDIF
560 xold%=x%
570 yold%=y%
580 FOR c%=0 TO n%
590 PROCmodify_sheep(x(c%),y(c%),d%(c%),herding%(c%))
600 NEXT
610 ENDPROC
620 :
630 DEF PROCmodify_sheep(RETURN xc,RETURN yc,RETURN dc%,RETURN herding%)
640 dogsep%=SQR((x%-xc)^2+(y%-yc)^2)
650 IF dogmoving% THEN
660 IF dogsep%<200 THEN
670 herding%=(200-dogsep%)*2
680 ENDIF
690 ELSE
700 IF dogsep%<2*sr% THEN
710 herding%=50
720 ELSE
730 IF herding%>0 THEN herding%-=1
740 ENDIF
750 ENDIF
760 :
770 IF herding%>0 THEN
780 PROCherding
790 ELSE
800 PROCgrazing
810 ENDIF
820 :
830 FOR e%=0 TO n%
840 IF e%<>c% THEN
850 sep%=SQR((xc-x(e%))^2+(yc-y(e%))^2)+1
860 IF sep%<2*sr% THEN
870 dc%=FNangle(xc,yc,x(e%),y(e%))+135
880 xc=xc+(2*sr%-sep%)*(xc-x(e%))/sep%
890 yc=yc+(2*sr%-sep%)*(yc-y(e%))/sep%
900 ENDIF
910 ENDIF
920 NEXT
930 :
940 IF xc>640-sr% THEN dc%=180:xc=640-sr%
950 IF xc<-640+sr% THEN dc%=0:xc=sr%-640
960 IF yc>512-sr% THEN dc%=270:yc=512-sr%
970 IF yc<-512+sr% THEN dc%=90:yc=sr%-512
980 ENDPROC
990 :
1000 DEF PROCherding
1010 xc=xc-4000*(x%-xc)/((x%-xc)^2+(y%-yc)^2)
1020 yc=yc-4000*(y%-yc)/((x%-xc)^2+(y%-yc)^2)
1030 dsheep%=9999
1040 f%=9999
1050 FOR e%=0 TO n%
1060 dsh%=SQR((x(e%)-xc)^2+(y(e%)-yc)^2)
1070 IF dsh%>5*sr% THEN
1080 IF dsh%<dsheep% THEN
1090 dsheep%=dsh%
1100 f%=e%
1110 ENDIF
1120 ENDIF
1130 NEXT
1140 IF f%<>9999 THEN
1150 xc=xc+24*(x(f%)-xc)/SQR((x(f%)-xc)^2+(y(f%)-yc)^2)
1160 yc=yc+24*(y(f%)-yc)/SQR((x(f%)-xc)^2+(y(f%)-yc)^2)
1170 ENDIF
1180 ENDPROC
1190 :
1200 DEF PROCgrazing
1210 dc%=dc%+(RND(3)-2)*5
1220 xc=xc+COS(RAD(dc%))*sp%
1230 yc=yc+SIN(RAD(dc%))*sp%
1240 ENDPROC
1250 :
1260 DEF PROCprint
1270 FOR c%=0 TO n%
1280 CIRCLE FILL x(c%),y(c%),sr%
1290 NEXT
1300 ENDPROC
1310 :
1320 DEF FNangle(x1,y1,x2,y2)
1330 a=DEG(ACS((x2-x1)/(SQR((x2-x1)^2+(y2-y1)^2)+1)))
1340 IF y2<y1 THEN a=360-a
1350 =a
```

Listing 2

```
10 REM >Rand1 (RR2)
20 REM by Dave Acton
30 REM for Archimedes only
40 REM (c) BAU June 1991
50 :
60 DIM code% &100
70 link=14:pc=15
80 FOR pass%=0 TO 2 STEP 2
90 P%=code%
100 [OPT pass%
110 .randbit
120 LDR R8,seed
130 LDR R9,xor
140 MOVS R8,R8,ASL #1
150 EORCS R8,R8,R9
160 MOVCC R0,#0
170 MOVCS R0,#1
180 STR R8,seed
190 MOV pc,link
200 :
210 .seed
220 EQUD TIME
230 .xor
240 EQUD &1D872B41
250 ]:NEXT pass%
260 :
270 PRINT"Pseudo-random bitstream:"'
280 FOR i%=1 TO 2000
290 PRINT;USR(randbit);
300 NEXT
310 END
```

Listing 3

```
10 REM >Rand2 (RR3)
20 REM by Dave Acton
30 REM for Archimedes only
40 REM (c) BAU June 1991
50 :
60 DIM code% &200
70 link=14:pc=15
80 FOR pass%=0 TO 2 STEP 2
90 P%=code%
100 [OPT pass%
110 :
120 .rand
```

Continued ▶



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```
 130 LDR R8,seed
 140 LDR R9,xor
 150 MOV RØ,#Ø
 160 ]
 170 FOR i%=Ø TO 31
 180 [OPT pass%
 190 MOVS R8,R8,ASL #1
 200 EORCS R8,R8,R9
 210 ]
 220 NEXT i%
 230 [OPT pass%
 240 STR R8,seed
 250 MOV RØ,R8
 260 MOV pc,link
 270 :
 280 .seed
 290 EQUD TIME
 300 :
 310 .xor
 320 EQUD &1D872B41
 330 ]:NEXT pass%
 340 :
 350 MODE 12
 360 FOR col%=Ø TO 14
 370 shade%=4+col%*12/15
 380 COLOUR col%+1,shade%<<4,255,shade%
<<4
 390 NEXT
 400 COLOUR 15
 410 PRINT"Sample of 32-bit random numb
ers:"'
 420 FOR i%=1 TO 80
 430 PRINT;~USR(rand),;
 440 NEXT
 450 PRINT'"Building table...";
 460 DIM t%(255)
 470 FOR i%=1 TO 10000
 480 t%(USR(rand) AND &FF)+=1
 490 NEXT
 500 VDU 13
 510 PRINTSPC(20)
 520 FOR i%=Ø TO 255
 530 c%=Ø
 540 FOR j%=Ø TO t%(i%)
 550 GCOL c%/3.5
 560 RECTANGLE FILL 4*i%,8*j%,4,8
 570 c%+=1
 580 NEXT
 590 NEXT
 600 END
```

Listing 4

```
 10 REM >Rand3 (RR4)
 20 REM by Dave Acton
 30 REM for Archimedes only
 40 REM (c) BAU June 1991
 50 :
 60 DIM code% &200
 70 sp=13:link=14:pc=15
 80 FOR pass%=Ø TO 2 STEP 2
 90 P%=code%
 100 [OPT pass%
 110 .rand
 120 LDR R8,seed
 130 LDR R9,xor
 140 MOV RØ,#Ø
 150 ]
 160 FOR i%=Ø TO 9
 170 [OPT pass%
 180 MOVS R8,R8,ASL #1
 190 EORCS R8,R8,R9
 200 ]
 210 NEXT i%
 220 [OPT pass%
 230 STR R8,seed
 240 MOV RØ,#512
 250 SUB RØ,RØ,#1
 260 AND RØ,R8,RØ
 270 CMP RØ,#360
 280 BGE rand
 290 MOV pc,link
 300 :
 310 .test
 320 STMFD (sp)!,{link}
 330 MOV R6,RØ
 340 :
 350 .testloop
 360 BL rand
 370 SUBS R6,R6,#1
 380 BNE testloop
 390 LDMFD (sp)!,{pc}
 400 :
 410 .seed
 420 EQUD TIME
 430 :
 440 .xor
 450 EQUD &1D872B41
 460 ]:NEXT pass%
 470 :
 480 MODE 12
 490 PRINT"Sample of random angles: (la
zy method)"'
 500 FOR i%=1 TO 80
 510 PRINT;USR(rand),;
 520 NEXT
 530 PRINT'"Timing 100000 calls..."
 540 A%=100000
 550 t%=TIME
 560 CALL test
 570 t%=TIME-t%
 580 PRINT"Time taken=";t%/100;" secs"
 590 END
```

Listing 5

```
 10 REM >Rand4 (RR5)
 20 REM by Dave Acton
 30 REM for Archimedes only
 40 REM (c) BAU June 1991
 50 :
 60 DIM code% &200
 70 sp=13:link=14:pc=15
 80 FOR pass%=Ø TO 2 STEP 2
 90 P%=code%
 100 [OPT pass%
 110 .rand
 120 LDR R8,seed
 130 LDR R9,xor
 140 MOV RØ,#Ø
 150 ]
 160 FOR i%=Ø TO 9
 170  [OPT pass%
 180  MOVS R8,R8,ASL #1
 190  EORCS R8,R8,R9
 200  ]
 210 NEXT i%
 220 [OPT pass%
 230 STR R8,seed
 240 MOV RØ,#512
 250 SUB RØ,RØ,#1
 260 AND RØ,R8,RØ
 270 LDR R1,mul
 280 MUL RØ,R1,RØ
 290 MOV RØ,RØ,LSR #16
 300 MOV pc,link
 310 :
 320 .test
 330 STMFD (sp)!,{link}
 340 MOV R6,RØ
 350 .testloop
 360 BL rand
 370 SUBS R6,R6,#1
 380 BNE testloop
 390 LDMFD (sp)!,{pc}
 400 :
 410 .mul
 420 EQUD (360/512)*&10000
 430 :
 440 .seed
 450 EQUD TIME
 460 .xor
 470 EQUD &1D872B41
 480 ]:NEXT pass%
 490 :
 500 MODE 12
 510 PRINT"Sample of random angles: (pr
oper method)"'
 520 FOR i%=1 TO 80
 530  PRINT;USR(rand),;
 540 NEXT
 550 PRINT'"Timing 100000 calls..."
 560 A%=100000
 570 t%=TIME
 580 CALL test
 590 t%=TIME-t%
 600 PRINT"Time taken=";t%/100;" secs"
 610 END
```

Listing 6

```
 10 REM >Atoms+ (RR6)
 41 REM Computer play by L C Howe
 42 REM (c) BAU June 1991
 43 :
 91 DIM status(players%)
 92 PRINT"For each player, enter H (hu
man) or C (computer)"
 93 FOR i%=1 TO players%
 94 PRINT;"Player ";i%" ";
 95 REPEAT:g=GET:UNTIL g=72 OR g=67
 96 status(i%)=(g=72):IF g=72 PRINT"Hu
man" ELSE PRINT"Computer"
 97 NEXT i%
 331 DIM weight(max_x%,max_y%)
 332 VOICES 2
 333 *CHANNELVOICE 2 9
 671 IF NOT status(p) PROCcom:ENDPROC
 975 SOUND 2,-7,200,1
 976 PROCbox(x*size%,y*size%,7):d=INKEY
(10)
 1650 :
 1660 DEF PROCcom
 1670 FOR i%=Ø TO max_x%
 1680 FOR j%=Ø TO max_y%
 1690 O%=player(i%,j%)
 1700 IF O% AND O%<>p THEN
 1710 weight(i%,j%)=-1000
 1720 ELSE
 1730 reactor=4+(i%=Ø)+(i%=max_x%)+(j%=Ø
)+(j%=max_y%)
 1740 sigma=FNadd(i%+1,j%)+FNadd(i%-1,j%
)+FNadd(i%,j%+1)+FNadd(i%,j%-1)
 1750 IF amount(i%,j%)=reactor-1 THEN
 1760 weight(i%,j%)=4*sigma
 1770 ELSE
 1780 weight(i%,j%)=125+sigma*(sigma>124
)-sigma*(sigma<125)-10*(reactor-amount(i
%,j%))
 1790 ENDIF
 1800 ENDIF
 1810 NEXT j%
 1820 NEXT i%
 1830 bm=-1000
 1840 FOR i%=Ø TO max_x%
 1850 FOR j%=Ø TO max_y%
 1860 IF weight(i%,j%)>bm bm=weight(i%,j
%):bi=i%:bj=j%
 1870 NEXT j%
 1880 NEXT i%
 1890 PROCreact(bi,bj,p)
 1900 g=INKEY(50)
 1910 ENDPROC
 1920 :
 1930 DEF FNadd(x,y)
 1940 LOCAL reactor
 1950 IF x<Ø OR x>max_x% OR y<Ø OR y>max
_y% THEN =Ø
 1960 IF player(x,y)=Ø THEN =Ø
 1970 reactor=4+(x=Ø)+(x=max_x%)+(y=Ø)+(
y=max_y%)
 1980 =-(player(x,y)<>p)*(5^(4+amount(x,
y)-reactor))
```

Listing 7

```
 10 REM >OddGask (RR7)
 20 REM by R G Taylor
 30 REM for Archimedes only
 40 REM (c) BAU June 1991
 50 :
 60 MODE 4
 70 OFF
 80 GCOL 3,1
 90 FOR X%=Ø TO 1024 STEP 4
 100 POINT X%,Ø
 110 MOVE Ø,Ø
 120 MOVE 1279,1023
 130 *SGET spr
 140 PLOT &ED,Ø,4
 150 NEXT
 160 END
```

Eight Bits

Listing 1

```
 10 REM 65Demo (EB1)
 20 REM By David Lawrence
 30 REM For BBC B
 40 REM (C) BAU June 1991
 50 :
 60 MODE Ø
 70 DIM code 1000
 80 zp=&70
 90 FOR pass=Ø TO 2 STEP 2:P%=code
 100 [OPT pass
 110 .stz
 120 LDA #42
 130 STA loc
 140 LDA loc
 150 STA preA
 160 EQUB &9C:EQUW loc         \ STZ abs
 170 LDA loc
 180 STA postA
 190 RTS
 200 :
 210 .ldxa
 220 LDA #198
 230 STA preA
 240 LDX #201
 250 STX preX
 260 LDY #123
 270 STY zp
 280 EQUB &A7:EQUB zp           \ LDXA zp
 290 STA postA
 300 STX postX
 310 RTS
 320 :
 330 .txaand
 340 LDA #&24
 350 LDX #&CC
 360 STA preA
 370 STX preX
 380 .txaimm
 390 EQUB &8B:EQUB &84         \ TXA/AND
 400 STA postA
 410 STX postX
 420 RTS
 430 :
 440 .roradc
 450 LDA #100
 460 STA preA
 470 LDX #235
 480 STX zp
 490 STX preX
 500 EQUB &67:EQUB zp          \ ROR/ADC
 510 STA postA
 520 RTS
 530 :
 540 .halt
 550 LDA #42
 560 JSR &FFEE
 570 EQUB &02                  \ HALT
 580 LDA #43
 590 JSR &FFEE
 600 RTS
 610 :
 620 .loc EQUB Ø
 630 :
 640 .preA   EQUB Ø
 650 .postA  EQUB Ø
 660 .preX   EQUB Ø
 670 .postX  EQUB Ø
 680 :
 690 ]NEXT
 700 PRINT"Testing STZ abs"
 710 CALL stz
 720 PRINT"  Before, ?loc = ";?preA
 730 PRINT"  After,  ?loc = ";?postA;"
(should be Ø)"
 740 PRINT'"Testing LDXA zp"
 750 CALL ldxa
 760 PRINT"  Before, A = ";?preA;" X =
";?preX;" ?zp=";?zp
 770 PRINT"  After,  A = ";?postA;" X =
";?postX;" (should be same as ?zp above
)"
 780 PRINT'"Testing TXAAND imm"
 790 CALL txaand
 800 PRINT"  Before, A = &";~?preA;" X
= &";~?preX;" ('imm' = &";~txaimm?1;")"
 810 PRINT"  After,  A = &";~?postA;" X
= &";~?postX;" (A should be &";~?preX;"
AND &";~txaimm?1;" = &";~?preX AND txai
mm?1;")"
 820 PRINT'"Testing RORADC zp"
 830 CALL roradc
 840 PRINT"  Before, A = ";?preA;" ?zp
= ";?preX
 850 PRINT"  After,  A = ";?postA;" ?zp
= ";?zp;" (?zp should be ?zp DIV 2 = ";
?preX DIV 2'TAB(31);"A should be A + ?zp
DIV 2 + ?zp MOD 2 = ";?preA+(?preX DIV
2)+(?preX MOD 2);")"
 860 PRINT'"Testing HALT"
 870 PRINT"  Before, should print a *"
 880 PRINT"  After,  should print a + (
should lock up first though!)"
 890 CALL halt
```

Listing 2

```
 10 REM 4ColØ (Eb2)
 20 REM By Garry Quested
 30 REM For M/C
 40 REM (C) BAU June 1991
 50 :
 60 MODE Ø
 70 MODE 128
 80 HIMEM=&3000
 90 VDU23;8202;Ø|
 100 PROCcode
 110 PROCdemo
 120 END
 130 :
 140 DEF PROCcode
 150 DIM code &100
 160 byte=&70
 170 FOR pass=Ø TO 2 STEP 2:P%=code
 180 [OPT pass
 190 PHP:PHA:TXA:PHA
 200 LDA byte
 210 EOR #1
 220 STA byte
 230 TAX
 240 LDA mem,X
 250 SEC
 260 :
 270 .chcols
 280 STA &FE21
 290 SBC #&10
 300 BMI chcols
 310 LDA #113
 320 JSR &FFF4
 330 PLA:TAX:PLA:PLP
 340 RTS
 350 :
 360 .mem
 370 EQUB &F6
 380 EQUB &F5
 390 ]NEXT
 400 ?byte=1
 410 ?&220=code MOD 256
 420 ?&221=code DIV 256
 430 *FX14 4
 440 ENDPROC
 450 :
```

Continued ▶

◀ Continued

```
  460 DEF PROCdemo
  470 PROCletters(0,0,"This is four colo
ur Mode 0")
  480 PROCletters(2,2,"in other words, e
ighty columns in quadricolour!")
  490 FOR I%=0 TO 3
  500 PROCstring(0,I% + 4,"This is colou
r number "+STR$I%,I%)
  510 NEXT
  520 END
  530 :
  540 DEF PROCletters(x,y,a$)
  550 FOR I%=1 TO LEN(a$)
  560 PROCstring(x+I%,y,MID$(a$,I%,1),I%
MOD3+1)
  570 NEXT
  580 :
  590 DEF PROCstring(X%,Y%,A$,C%)
  600 *FX 112,1
  610 COLOUR (C% MOD 2):PRINTTAB(X%,Y%);
A$
  620 *FX 112,0
  630 COLOUR (C% DIV 2):PRINTTAB(X%,Y%);
A$
  640 ENDPROC
```

Listing 3

```
   10 REM 16Col1 (Eb3)
   20 REM By Garry Quested
   30 REM For M/C
   40 REM (C) BAU June 1991
   50 :
   60 MODE 1
   70 MODE 129
   80 HIMEM=&3000
   90 VDU23;8202;0|
  100 PROCcode
  110 PROCdemo
  120 END
  130 :
  140 DEF PROCcode
  150 DIM code &100
  160 byte=&70:byte2=&71
  170 FOR I%=0 TO 2 STEP 2:P%=code
  180 [OPT I%
  190 PHP:PHA:PHX
  200 LDA byte
  210 EOR #12
  220 STA byte
  230 TAX
  240 LDY #12
  250 :
  260 .loop
  270 LDA cols1,X
  280 STA &FE21
  290 INX
  300 DEY
  310 BNE loop
  320 LDA byte2
  330 EOR #1
  340 STA byte2
  350 TAX
  360 LDA #113
  370 JSR &FFF4
  380 PLX:PLA:PLP
  390 RTS
  400 :
  410 .cols1
  420 EQUB&26:EQUB&36:EQUB&66:EQUB&76
  430 EQUB&85:EQUB&95:EQUB&C5:EQUB&D5
  440 EQUB&A4:EQUB&B4:EQUB&E4:EQUB&F4
  450 :
  460 .cols2
  470 EQUB&21:EQUB&31:EQUB&61:EQUB&71
  480 EQUB&82:EQUB&92:EQUB&C2:EQUB&D2
  490 EQUB&A3:EQUB&B3:EQUB&E3:EQUB&F3
  500 :
  510 .mem
  520 EQUB &F6:EQUB &F5
  530 ]NEXT
  540 ?byte=0:?byte2=1
  550 ?&220=code MOD 256
  560 ?&221=code DIV 256
  570 *FX14 4
  580 ENDPROC
  590 :
  600 DEF PROCdemo
  610 PROCletters(0,0,"This is 16 colour
 Mode 1")
  620 FOR I% = 0 TO 15
  630 PROCstring(0,I% + 4,"This is colou
r number "+STR$I%,I%)
  640 NEXT
  650 ENDPROC
  660 :
  670 DEF PROCletters(x,y,a$)
  680 FOR I%=1 TO LEN(a$)
  690 PROCstring(x+I%,y,MID$(a$,I%,1),I%
MOD15+1)
  700 NEXT
  710 :
  720 DEF PROCstring(X%,Y%,A$,C%)
  730 *FX 112,1
  740 COLOUR (C% MOD 4):PRINTTAB(X%,Y%);
A$
  750 *FX 112,0
  760 COLOUR (C% DIV 4):PRINTTAB(X%,Y%);
A$
  770 ENDPROC
```

Listing 4

```
   10 REM Clash (Eb4)
   20 REM By Tris Mabbs
   30 REM For BBC B/B+/M/C/E
   40 REM (C) BAU June 1991
   50 :
   60 MODE7
   70 *FX229,1
   80 VDU 23;8202;0;0;0;0
   90 VDU 28,3,24,39,4
  100 DIM K$(8,16),K%(8,16)
  110 FOR I%=1 TO 16
  120 FOR J%=1 TO 8
  130 READ k$
  140 K$(J%-1,I%-1)=k$
  150 VDU 31,(J%-1)*4,I%-1,135
  160 PRINT;k$;
  170 NEXT
  180 NEXT
  190 REPEAT
  200 FOR I%=1 TO 127
  210 IF INKEY-I% PROCkey(I%)
  220 NEXT
  230 UNTIL 0
  240 :
  250 DEF PROCkey(in%)
  260 x%=(in%-1)DIV16
  270 y%=(in%-1)MOD16
  280 K%(x%,y%)=5
  290 VDU 31,x%*4,y%,135-K%(x%,y%)
  300 PROCclash
  310 VDU 7
  320 REPEAT UNTIL NOT INKEY-in%
  330 ENDPROC
  340 :
  350 DEF PROCclash
  360 FOR X%=0 TO 7
  370 IF X%<>x% PROCy
  380 NEXT
  390 ENDPROC
  400 :
  410 DEF PROCy
  420 FOR Y%=0 TO 15
  430 IF Y%<>y% PROCq
  440 NEXT
  450 ENDPROC
  460 :
  470 DEF PROCq
  480 IF K%(x%,Y%)=5 AND K%(X%,Y%)=5 PRO
Cm(X%,y%)
  490 IF K%(X%,Y%)=5 AND K%(X%,y%)=5 PRO
Cm(x%,Y%)
  500 IF K%(X%,y%)=5 AND K%(x%,Y%)=5 PRO
Cm(X%,Y%)
  510 ENDPROC
  520 :
  530 DEF PROCm(x,y)
  540 VDU 31,x*4,y,129
  550 ENDPROC
  560 :
  570 DATA shf,Q,f0,1,CLk,SLk,Tab,Esc
  580 DATA ctl,3,W,2,A,S,Z,f1
  590 DATA ?,4,E,D,X,C,spc,f2
  600 DATA ?,5,T,R,F,G,V,f3
  610 DATA ?,f4,7,6,Y,H,B,f5
  620 DATA ?,8,I,U,J,N,M,f6
  630 DATA ?,f7,9,O,K,L,",",f8
  640 DATA ?,-,0,P,@,;,.,f9
  650 DATA ?,^,_,[,:,],/,\
  660 DATA ?,<-,vv,^^,ret,del,cpy,->
  670 DATA ?,?,?,?,?,?,?,?
  680 DATA ?,?,?,?,?,?,?,?
  690 DATA ?,?,?,?,?,?,?,?
  700 DATA ?,?,?,?,?,?,?,?
  710 DATA ?,?,?,?,?,?,?,?
  720 DATA ?,?,?,?,?,?,?,?
```

Listing 5

```
   10 REM Wiggles (Eb5)
   20 REM By D Parry
   30 REM For BBC B/B+/M/C/E/A
   40 REM (C) BAU June 1991
   50 :
   60 MODE1:VDU23;8202;0;0;0;0;
   70 s%=8
   80 L%=TRUE
   90 Y%=s%
  100 c%=0
  110 MOVE0,0
  120 DRAW 1280,0
  130 REPEAT
  140 Y%=Y%-s%
  150 GCOL 0,c%+1
  160 c%=(c%+1)MOD3
  170 REPEAT
  180 Y%=Y%+s%
  190 UNTIL POINT(0,Y%)<1 OR Y%>1023
  200 y%=Y%
  210 x%=0
  220 MOVE 0,Y%
  230 REPEAT
  240 F%=POINT(x%+s%,y%)<1
  250 D%=POINT(x%,y%-s%)<1
  260 G%=POINT(x%+2*s%,y%)<1
  270 E%=POINT(x%+s%,y%-s%)>0
  280 MOVE x%,y%
  290 IF D% y%=y%-s%:L%=FALSE
  300 IF F% AND D%=0 PROCflat
  310 IF F%+D%=0 y%=y%+s%
  320 DRAW x%,y%
  330 UNTIL x%>1279
  340 UNTIL Y%>1023 AND y%>1023
  350 VDU 7
  360 REPEAT UNTIL 0
  370 :
  380 DEF PROCflat
  390 IF RND(10)=1 AND L% AND G% AND E%
PLOT 1,0,s%:PLOT 1,s%,0:L%=FALSE ELSE L%
=TRUE
  400 x%=x%+s%
  410 ENDPROC
```

Listing 6

```
   10 DIMa 4,g 4,t 4:FORI=1TO4:a?I=RND(1
0)+47:NEXT:S=1:REPEATPRINT;S":";:B=0:FOR
I=1TO4:A=GET:VDUA:E=A=a?I:g?I=-A*(E=0):t
?I=-(E=0)*a?I:B=B-E:NEXT:W=0:FORG=1TO4:F
ORT=1TO4:V=g?G:E=(V=t?T)*(V>0):W=W+E:g?G
=-V*(E=0):t?T=-(E=0)*t?T:NEXT,:PRINTB;"
"W:S=S+1:UNTILB=4
```

Listing 7

```
   10 REM Linze (Eb7)
   20 REM Freaky line display
   30 REM for all machines
   40 REM by James Richards
   50 REM (c) BAU June 91
   60 :
   70 MODE 4
   80 VDU 23;8202;0;0;0;
   90 DIM x%(1),y%(1)
  100 DIM xv%(1),yv%(1)
  110 FOR loop%=0 TO 1
  120 x%(loop%)=RND(640)+320
  130 y%(loop%)=RND(512)+266
  140 NEXT
  150 PROCrandomize
  160 :
  170 left%  =FALSE
  180 right% =FALSE
  190 top%   =FALSE
  200 bottom%=FALSE
  210 :
  220 REPEAT
  230 IF RND(200)=1 THEN PROCrandomize
  240 MOVE x%(0),y%(0)
  250 DRAW x%(1),y%(1)
  260 :
  270 FOR loop%=0 TO 1
  280 x%(loop%)=x%(loop%)+xv%(loop%)
  290 y%(loop%)=y%(loop%)+yv%(loop%)
  300 :
  310 IF x%(loop%)>1279 THEN right% =TRU
E
  320 IF x%(loop%)<0    THEN left%  =TRU
E
  330 IF y%(loop%)>1023 THEN top%   =TRU
E
  340 IF y%(loop%)<0    THEN bottom%=TRU
E
  350 :
  360 IF right% =TRUE THEN xv%(loop%)=-x
v%(loop%)   :right% =FALSE
  370 IF left%  =TRUE THEN xv%(loop%)=AB
S xv%(loop%):left%  =FALSE
  380 IF top%   =TRUE THEN yv%(loop%)=-y
v%(loop%)   :top%   =FALSE
  390 IF bottom%=TRUE THEN yv%(loop%)=AB
S yv%(loop%):bottom%=FALSE
  400 NEXT
  410 PRINT
  420 UNTIL 0
  430 :
  440 DEF PROCrandomize
  450 VDU 19,1,RND(6)+1;0;
  460 FOR loop%=0 TO 1
  470 xv%(loop%)=RND(40)-20
  480 yv%(loop%)=RND(40)-20
  490 NEXT
  500 ENDPROC
```

24 Pin 2

Listing 1

```
   10 REM >ConvFW - Convert Fontwise fon
ts
   20 REM By David Lawrence
   30 REM For BBC B/B+/M/C/E/A
   40 REM (C) BAU June 1991
   50 :
   60 MODE 4
   70 ON ERROR CLOSE#0:REPORT:PRINT" at
line ";ERL:END
   80 PROCinit
   90 PROCopenfiles
  100 PROCfileheader
  110 FOR char=0 TO 94
  120 width=FNreadchar(char)
  130 PROCwritechar(width)
  140 PROCmovebase
  150 NEXT
  160 PROCclosefiles
  170 END
  180 :
  190 DEF PROCinit
  200 grid_width = 37
  210 grid_height= 24
  220 char_width = 18
  230 char_height= 17
  240 DIM grid(grid_width-1,grid_height-
1)
  250 xbase= 0
  260 ybase= 0
  270 ESC=27
  280 ENDPROC
  290 :
  300 DEF PROCopenfiles
  310 INPUT"Input file     : "infile$
  320 INPUT"Output file    : "outfile$
  330 vdu1_flag=FNyn("Insert VDU 1s?")
  340 space_flag=FNyn("Auto spacing?")
  350 in =OPENIN(infile$)
  360 out=OPENOUT(outfile$)
  370 VDU 23;8202;0;0;0;0;
  380 PRINT'"Loading file..."
  390 ENDPROC
  400 :
  410 DEF PROCclosefiles
  420 IF vdu1_flag BPUT#out,3
  430 CLOSE #in
  440 CLOSE #out
  450 PRINTTAB(0,21);"File converted"
  460 ENDPROC
  470 :
  480 DEF FNyn(a$)
  490 PRINTa$;TAB(15);": ";
  500 yes=((GET AND &DF)=ASC"Y")
  510 IF yes PRINT"Yes" ELSE PRINT"No"
  520 =yes
  530 :
  540 DEF PROCfileheader
  550 IF vdu1_flag BPUT#out,2
  560 PROCsend("ESC 64")
  570 PROCsend("ESC 120 1")
  580 PROCsend("ESC 33 0")
  590 PROCsend("ESC 58 0 0 0")
  600 PROCsend("ESC 37 1")
  610 IF space_flag PROCsend("ESC 51 cha
r_height+1")
  620 PROCsend("ESC 38 0 32 126")
  630 ENDPROC
  640 :
  650 DEF PROCsend(str$)
  660 str$=str$ + " "
  670 REPEAT
  680 eval=EVALstr$
  690 str$=MID$(str$,INSTR(str$," ") + 1
)
  700 PROCbput(eval)
  710 UNTIL str$=""
  720 ENDPROC
  730 :
  740 DEF PROCbput(b%)
  750 IF vdu1_flag BPUT #out,1
  760 BPUT #out,b%
  770 ENDPROC
  780 :
  790 DEF FNreadchar(c%)
  800 PTR#in=95+(c%*char_width*3)
  810 width=-1
  820 FOR y=0 TO 1
  830 FOR x=0 TO char_width - 1
  840 bget=FNbget(in)
  850 IF bget<>0 AND x>width width=x
  860 mask=128
  870 FOR bit=0 TO 7
  880 PROCset(x,bit * 2 + y,SGN(bget AND
mask))
  890 mask=mask DIV 2
  900 NEXT
  910 NEXT
  920 NEXT
  930 FOR x=0 TO char_width - 1
  940 bget=FNbget(in)
  950 PROCset(x,16,bget AND 1)
  960 NEXT
  970 =width + 1
  980 :
  990 DEF FNbget(file)
 1000 b%=BGET#file
 1010 IF b%<>0 AND x>width width=x
 1020 =b%
 1030 :
```

Continued ▶



◀ Continued

```
1Ø4Ø DEF PROCset(x%,y%,v%)
1Ø5Ø grid(x%,y%)=v%
1Ø6Ø IF v% PLOT 69,(xbase + x%)*4,823-(ybase+y%)*4
1Ø7Ø ENDPROC
1Ø8Ø :
1Ø9Ø DEF PROCwritechar(width)
11ØØ PROCsend("Ø width 36-width")
111Ø IF width=Ø ENDPROC
112Ø FOR x=Ø TO width-1
113Ø FOR y=Ø TO 2
114Ø byte=Ø
115Ø mask=128
116Ø FOR bit=Ø TO 7
117Ø byte=byte+grid(x,y*8+bit)*mask
118Ø mask=mask DIV 2
119Ø NEXT
12ØØ PROCbput(byte)
121Ø NEXT
122Ø NEXT
123Ø ENDPROC
124Ø :
125Ø DEF PROCmovebase
126Ø xbase=xbase+char_width+1
127Ø IF xbase<319-char_width ENDPROC
128Ø xbase=Ø
129Ø ybase=ybase+char_height+2
13ØØ ENDPROC
```

Listing 2

```
1Ø REM >MakeFnt
2Ø REM By David Lawrence
3Ø REM For BBC B/B+/M/C/E/A
4Ø REM (c) BAU June 1991
5Ø :
6Ø MODE 7:VDU 23;82Ø2;Ø;Ø;Ø;Ø;
7Ø base64$="Ø123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ!#$%&'()*+-.;<=>?@[\]^_£{|}~"
8Ø sum = Ø
9Ø FOR i = 1 TO LENbase64$
1ØØ sum = sum + ASCMID$(base64$,i,1)
11Ø NEXT
12Ø IF sum <> 4443 PRINT"'base64$' string incorrect":END
13Ø READ file$,length
14Ø out = OPENOUT(file$)
15Ø line = Ø
16Ø bits = Ø
17Ø data = Ø
18Ø sum = Ø
19Ø READ line$
2ØØ REPEAT
21Ø nibbles = FNnibble
22Ø IF nibbles AND 8 count=FNnibble+1:nibbles=nibbles AND 7 ELSE count=1
23Ø poke = FNgetdata
24Ø FOR i = 1 TO count
25Ø PROCbput((poke AND &FFØØØØ) DIV 65536)
26Ø PROCbput((poke AND &ØØFFØØ) DIV 256)
27Ø PROCbput((poke AND &ØØØØFF) DIV 1)
28Ø NEXT
29Ø UNTIL length = Ø
3ØØ CLOSE #out
31Ø PRINT"Font created O.K."
32Ø END
33Ø :
34Ø DEF FNgetdata
35Ø IF nibbles = Ø THEN =Ø
36Ø dat = Ø
37Ø FOR d = 1 TO nibbles
38Ø dat = (dat * 16) OR FNnibble
39Ø NEXT
4ØØ =dat
41Ø :
42Ø DEF FNnibble
43Ø IF bits < 4 PROCread
44Ø bit = 2 ^ (bits - 1)
45Ø nib = Ø
46Ø FOR i = 3 TO Ø STEP -1
47Ø IF data AND bit nib = nib OR 2 ^ i
48Ø bit = bit DIV 2
49Ø NEXT
5ØØ bits = bits - 4
51Ø data = data AND (2 ^ bits) - 1
52Ø = nib
53Ø :
54Ø DEF PROCread
55Ø IF LENline$=2 PROCchecksum
56Ø char$ = LEFT$(line$,1)
57Ø line$ = MID$(line$,2)
58Ø val = INSTR(base64$,char$) - 1
59Ø sum = sum + val
6ØØ data = data * 64 + val
61Ø bits = bits + 6
62Ø ENDPROC
63Ø :
64Ø DEF PROCchecksum
65Ø IF (sum MOD 256) <> EVAL("&"+line$) PRINT'"Checksum error at line ";line*1Ø+77Ø:CLOSE #out:END
66Ø READ line$
67Ø line = line + 1
68Ø sum = Ø
69Ø ENDPROC
7ØØ :
71Ø DEF PROCbput(bput)
72Ø PRINT ;"Bytes to go : ";length;" ";CHR$13;
73Ø IF length <> Ø BPUT #out,bput:length = length -1
74Ø ENDPROC
75Ø :
76Ø DATA DLlight,&1B34
77Ø DATA ORG1+%W16[8GØRO#ØH+YOØ86VWØ2A
78Ø DATA ØO!ØØ<XWØØ8#F~}PWØ19X8ØØ8K]27
79Ø DATA Ø44Ø12ØØJØØ88]Ø44Ø12ØØJØØ268C
8ØØ DATA #&ØØØ+OØ!~~|-Ø8Ø)YØ9F~~RW2ØC7
81Ø DATA A?W28ONØC2D88?WJY1*OGJXØ]]Ø44
82Ø DATA GG6WF~~RW423ZW1ØWQØ426<WXE122
83Ø DATA 4]4ZGIDØ;X<OEØ1Y14ØE5ØHØ1&2B1
84Ø DATA 2ØKWW5882I214HØH4G8H444E1ØY12
85Ø DATA 2XG2W343QØØGH!Ø216GØG4PØ1ØX26
86Ø DATA YØ82E4W4ØXYØW1E5ØGØH!2ØØ[WØ76
87Ø DATA ØSM3W3QØHØH!1226G48GPØWI1Y25F
88Ø DATA 1G6882ØOWWO1Y12G684HØOWI21Y61
89Ø DATA Ø;8E5ØØ11!ØØ26WØØ95XGQ8I8X93E
9ØØ DATA 1AØ]OØØØE5ØØØ1YØØØ68ØØCOOØØDB
91Ø DATA 26EØ11ØØGWØ4;ØØUOMØØ289}F]565
92Ø DATA .1;Ø5_ØØ54Ø3$5WØØY4WØ1HSØ1U89
93Ø DATA 3]5.ØØVY5@?ØØ88=Ø6WØ8ØQØØG4BC
94Ø DATA <ØQ62&KGYW~~[]ØØ&&KIXW)4G4=F9
95Ø DATA Ø6WØ8ØQØØ1XSØØ21(HØ~~[]ØØG(EA
96Ø DATA 1ØSOOØØ27LØØØMØØØOGØØ1$ØØ65DB
97Ø DATA ;ØØ86.4AGG766ØØØY$OØØSMØØØO58
98Ø DATA WØØ3XGØØØQØØØ4H4'51YX428A5Ø16
99Ø DATA AØ*HØ38Ø*KØ3WØ;HØØGWØC5ØØ4W5B
1ØØØ DATA ØØ>65!1{3OCEØ91Ø1GWØ6W2ØØQØ51
1Ø1Ø DATA GØ3XG4ØØPØWØ3!88ØØOWGØ3XG4Ø38
1Ø2Ø DATA ØPØ8Ø1&ØWØ6W1Ø1EØ8[337;C;<XA9
1Ø3Ø DATA KØØ8J4WØ1F~~RWØX'O2Ø1YØGØ68C1
1Ø4Ø DATA 2ØØPW8Ø1$1ØØ6&4ØØQWGØ5Y1ØØU2D
1Ø5Ø DATA 4WWØBX88Ø4]I2Ø2E4WW13X84ØW]AD
1Ø6Ø DATA I1ØGE4W881YØHØ68Ø]Ø]IØØØ68Ø37
1Ø7Ø DATA COMHØ2GWØKGØ1&1ØØ6W42Ø]?2ØW85
1Ø8Ø DATA EOWW81Y11GE5ØGK1!ØYG6G1;WQØB2
1Ø9Ø DATA Ø21&ØØ4H]>65!ØØXQH&XAX8YG(6Ø4
11ØØ DATA 2CGA<82DØA<W2GGØ*4WØ!GØ9F~~Ø7
111Ø DATA RWØØAH8>65!ØOZ6XD!1&ØOG6W61D1
112Ø DATA Ø]?2ØWEOWW81Y2ØGE9ØW41!2Ø86A1
113Ø DATA W8ØWQØØ14UC<XPØØ]X4Y1&ØØO6WE2
114Ø DATA Ø3ØPØØK1!Ø2G6GØHØPØ281YØGW6ØA
115Ø DATA 822ØOWG81Y2ØWE8WØ81YØØGE9ØØ29
116Ø DATA 41!ØØ86WØØWQØØ14UC<XPWØ34WØ72
117Ø DATA 1Y2ØØ6G8ØØQØWØ58Ø2IØ14WØX8ØEC
118Ø DATA GIØ84W4182ØI1Ø4WW18GØI8Ø4!ØØF
119Ø DATA 1AØØJØØ4WØØ>65!Ø3Y4I86W1;WQ78
12ØØ DATA Ø8!3YG45ØPØW83$882ØOWGK3XG47A
121Ø DATA 5ØPØ8!1!ØS86WØØWQØØ14UC<XP39Ø
122Ø DATA W114Ø;I2Ø;?1Ø;]ØWOWW21!2Ø86E6
123Ø DATA W8ØXIØ8!G4H418HØK4G6123ØGWW4E
124Ø DATA 44GØ)Ø1<XWØØ8!*CSOØØØ27OWØØBA
125Ø DATA 1!ØØØ6WØ338KOGØØ22&H2XAA54&3A
126Ø DATA OA<41CW1&Ø2Ø6WØGØPØ1Ø1!Ø8Ø632
127Ø DATA 8ØWØOWØ1DX4ØØ8A-GY564ØØØWZW77
128Ø DATA ØOW2Ø1YØ4Ø6GØGØPØØW1&Ø2Ø6WØ11
129Ø DATA 41CG6XW(54&IYX4265;8Ø44Ø31875
13ØØ DATA Ø33GØ32WØ18Ø6PWW1X8ØW;O1ØHØ47
131Ø DATA GC9ØW488124ØGHØ3]Ø8WLØ3WC<W79
132Ø DATA ?13W2;HØ1GWØ6W23WQØGH3YG4889B
133Ø DATA PØXØJ$88G4]Y1226844GPØ9~X!ØC2
134Ø DATA W1E5Ø4ØH&Ø816WØG4C<W-ØX@NØØAC
135Ø DATA 1YØØØ6GØØ1QØØØ8K8O8W9WCQØ=841
136Ø DATA 3GWGO848214ØWIØ84G212ØWGO831C
137Ø DATA GWCYØ<&2O28261GI4MWØØØPØØØ15A
138Ø DATA YØØ85J~~[]82Ø£=2ØWEKWW81Y1156
139Ø DATA GE5ØGK1!ØYG6G1;WQØØ21&ØØ4H]97
14ØØ DATA X^MØEØ>63G4EØB14Ø52ØØQØ8Ø1&3E
141Ø DATA 1ØØE9ØGØ1!2ØØEOWWØ1Y1ØØE9ØGØØ
142Ø DATA Ø1!ØWØ6W2ØØQØ4Ø51Ø1EØ8?1285EC
143Ø DATA J~~[]8ØØ£=2ØØE4WWØ1Y1ØØE9ØG13
144Ø DATA Ø1!ØWØ6W2ØØQØ4Ø51Ø1EØ8?13COØ4
145Ø DATA BW8UL.~~RWW83.882Ø^I2ØWEKWW89
146Ø DATA Ø1YØØ7#R~~[]82Ø>]2Ø<O2Ø<OØØ61
147Ø DATA 8VLG3WC<W?13W2;HØ1GWØ6W2ØØQDA
148Ø DATA ØGØ3YG4ØØPØWØ1Y2ØØEKWW21Y1Ø2F
149Ø DATA 8E9ØG21!ØW86W2ØWQØ4251ØXE2825
15ØØ DATA ?92E27#R~~[]Ø2Ø)]2(W4~~|-ØØ2Ø
151Ø DATA 7#QØØE?WWØ1Y3~~[]8ØØ£22ØØ682F
152Ø DATA ØØULWØ44'4GQØØØ1&2ØØEDØWØ3%42
153Ø DATA 88ØØ]?2ØØ6W8ØØQØWØ58Ø1IØØ!W4A
154Ø DATA ØH8ØOJ~]275Z~~[]Ø2ØAØ*HGB8Y66
155Ø DATA 2<GG*&2C4G1C8WØ*5ØØKWØ3XW8ØAF
156Ø DATA ØQØØØ3XGØØØ]IØØØ68ØØUL.~~RWC1
157Ø DATA ØØ3.8ØØØ_=ØØØ68ØØVLV~~RWGØ1D1
158Ø DATA 2ØØGGØ3WØDØØ=Ø34ØAØ9Ø8W8G61E5
159Ø DATA GI4H8K624282G2W34ØCWØ?Ø3WØG37
16ØØ DATA GØ48Ø14ØØJ~~[]ØØSMF~~RWGØ142F
161Ø DATA ØØGWØC4GØ3WØ*KØ38Ø*HØ2WA5Ø834
162Ø DATA W&HØO!K4'4GQØØØ1!ØØØ6GF~~RWØ7
163Ø DATA Ø21KØEØ>63G4EØB14Ø52ØØQØ8Ø1BD
164Ø DATA &1ØØE9ØGØ1!2ØØEOWWØ1Y1ØØE9Ø18
165Ø DATA GØ1!ØWØ6W2ØØQØ4Ø51Ø1EØ8?13CFC
166Ø DATA OBW8UL.~~RWW23FW233W233G431Ø2
167Ø DATA 88114ØFWØY1KØEØ>63G4EØB14Ø5FD
168Ø DATA 2ØØQØ8Ø1&1ØØE9ØGØ1!2ØØEKWWØFE
169Ø DATA 1Y2Ø8684ØGPØG11!1Ø26G4Ø4PØ8EØ
17ØØ DATA ØH&ØWØ$W1Ø1GGØJW2QØ1ØH!Ø36655
171Ø DATA GØ3WOWØ1^M~~|-2Ø8C-Ø8C6ØCC62Ø
172Ø DATA ØAC6Ø9C6Ø8*5ØGKG41&1ØG6W22ØØC
173Ø DATA PØ881!ØHØ68Ø]ØOWØ1^M7Ø9281H59
174Ø DATA 1ØE6ØGG3ZG82Ø£22ØW6841Ø]!1Ø44
175Ø DATA G6G2ØWQØ821&ØG4JWE8UL&ØØ>OØ98
176Ø DATA ØJ~~[]8ØØ>8ØØ8UL.~W8O51AH4E5E
177Ø DATA 6ØØØ3ZGØØØ^IØØØEDØØØ1&ØØØ6WF1
178Ø DATA ØØ14H8K8OJ~]26L-ØØ4ØØ11ØØFØ54
179Ø DATA Ø=Ø36Ø9Ø8;61OH1*ØØØ68ØØØRØØØ2
18ØØ DATA Ø4M62C2G36ØCWØ{Ø44Ø16ØØIØØ2D4
181Ø DATA 8LFWØ46ØØ[Ø36Ø9W8O5X5&ØØØ6O4F
182Ø DATA ØØ1QØØØOXW$Ø<W3OØGOØ4]Ø11WØ8C
183Ø DATA DWØ<W2O261OHQØØØ1$ØØØMWØØ684F
184Ø DATA O9WCOØ[Ø46Ø1EØØ8SM8ØØOWGØ1!63
185Ø DATA 1ØØ6G2ØØQØ4Ø51Ø1EØA<G4CWY<41E
186Ø DATA GAW&KØ(2<4GCWY<G4EØB14Ø52ØØ9F
187Ø DATA QØGØ1!1ØØ6G8ØØOWØ1|LWØ31GØ12E
188Ø DATA 2ØØ;HØØEØ2<GØCW2<4ØAØ&KØZ|-CB
189Ø DATA ØØG2G2WB4GØ=ØB5ØØ]ØC4GØ48Ø3ØC
19ØØ DATA 1GØ18ØØ8SM8ØØOWWØ3XO8ØØQWWØ52
191Ø DATA 5Y2ØØM88Ø2]I2Ø1688Ø8]I2Ø4681A
192Ø DATA 8ØW]I2ØG6882Ø]I21Ø6888Ø]I2457
193Ø DATA Ø688WØ]I2GØ68AØØ]I3ØØ688ØØO25
194Ø DATA WØØ|XKØØ8TF~~R~WØ3J6ØØ54Ø75EF
195Ø DATA YØØC5ØØ48Ø314ØØ]ØB5ØØ=ØB4GØEØ
196Ø DATA &2XG28A4G6951AH46WØØØ]KØØØ62F
197Ø DATA 8ØØFOLØØ27IØØDCOØØKV~~R~Ø1'C5
198Ø DATA QØWØ=ØB5Ø2<WØ;HØØ;IØØ;KØØ;ODE
199Ø DATA ØØ;KØØ;IØØ;HØØ*OØB5Ø2<8Ø8Z\B8
2ØØØ DATA <ØØ3V4ØØD8GØØKGØON\ØØØ]=ØØW65F
2Ø1Ø DATA 81~~RW883Y842Ø^=2ØWE8WGØ1YØFB
2Ø2Ø DATA WØ681ØØOWØØ1YØ365!Ø62PYWJ4Ø36
2Ø3Ø DATA QØØG1&Ø2ØE5ØØW1!Ø4ØEOW1Ø1YØ1B
2Ø4Ø DATA 2ØE5ØØW1!Ø1Ø6WØ4ØQØØ84$O\~[95
2Ø5Ø DATA ]ØCOMV~~RWØ6O&4<Ø6WØ4ØQØØW32C
2Ø6Ø DATA XGØ8ØPØ1Ø3$8ØGØOWØW3XGØ8ØPØ41
2Ø7Ø DATA ØG1&Ø1Ø6WØ219$8OC<LSØ1W$O&4AB
2Ø8Ø DATA <Ø6WØ4ØQØØW3XGØ8ØPØ1Ø3$8ØGØ2C
2Ø9Ø DATA OWØW3XGØ8ØPØØG1&Ø1Ø6WØCOMGØ57
21ØØ DATA O9$A1CG1&Ø1Ø6WØ8Ø]KØ2Ø6GØGØ3A
211Ø DATA ^YØ4Ø68Ø8Ø]KØ2Ø6GØ4ØQØØG1&Ø3Ø
212Ø DATA ØWIP!~~|-Ø35@&Ø62TY!J4GQØØH7A
213Ø DATA 1&Ø24E5ØØX1!Ø44EOW111YØ24E514
214Ø DATA ØØX1!Ø146WØ4GQØØ9Ø%Ø>4@]ØØ87B
215Ø DATA I?GØGV~[]2GØ;KGØ;OGØ;OØØC<X96
216Ø DATA PØ1W$O&5OØG1&G1Ø6XØ8Ø]K82Ø692
217Ø DATA GWGØ^Y44Ø68G8Ø]K82Ø6GW4ØQ4Ø77
218Ø DATA G1&GØWLWØP$CØØVRØØ<XP~~|-ØØ77
219Ø DATA O2WB4G2=8Ø+?ØB8W2<4ØAØ9W8VRD5
22ØØ DATA WØ;<XKØØ8#CV~RWØ;<XKØØ8FJ4Ø4C
221Ø DATA ØD4WØØLCV~R]Ø<XP~~|-ØØØ6WØØ7D
222Ø DATA 14P4'596A4O&IIXG(61CG1&Ø1Ø67F
223Ø DATA WØ8ØPØØW1!Ø4Ø68ØGØOWØ;<XKØØ76
224Ø DATA 8#F~~RWØ1|L1~|-ØØ;34Ø*IØBLØ88
225Ø DATA 2<8ØCGØ*ØZ|-ØØ;34Ø*IØBLØ2<8E1
226Ø DATA ØCGØ*ØZ|-Ø365!7~[]Ø1WAØ*HØB2F
227Ø DATA 8W2\GØ*YØB4GØ&Ø$ØX|-Ø365!Ø6FØ
228Ø DATA 2PYWJ4ØQØØG1&Ø2ØE5ØØW1!Ø4ØE33
229Ø DATA OW1Ø1YØ2ØE5ØØW1!Ø1Ø6WØ4ØQØØFB
23ØØ DATA 84$OXW>65!7~[~;1$A1CG1&Ø1Ø656
231Ø DATA WØ8Ø]KØ2Ø6GØGØ^YØ4Ø68Ø8Ø]KØ5D
232Ø DATA 2Ø6GØ4ØQØØG1&ØØWIPY63COMGØO47
233Ø DATA 9$A1CG1&Ø1Ø6WØ8Ø]KØ2Ø6GØGØ^5B
234Ø DATA YØ4Ø68Ø8Ø]KØ2Ø6GØ4ØQØØG1&ØØF7
235Ø DATA WIPZV~R~Ø<LS1~|-ØØO2WB4G2=8C8
236Ø DATA Ø+?ØB8W2<4ØC<XPØC3XWØ4WPØØYF1
237Ø DATA 3YGØ8G^2Ø44EKW1ØZXGØ88]KØ2186
238Ø DATA 6WØ44QØØGC>4M4ØØØXBHØ1F~~RWBB
239Ø DATA 1Ø2>GØC<XP1~WM4G]OØØØE9ØØØ3B1
24ØØ DATA %8ØØØ]!ØØØ6WØØØQØØØ4MD~|-Ø39F
241Ø DATA 5L;4Ø38ØCOØ!ØYØXWK4X5&ØØØ6G8Ø
242Ø DATA ØØØOWØØ1!ØØØMWØØ2526282G36ØC7
243Ø DATA CWØ?Ø3CNMWOØCOØ$ØXWM4MWØØØPC8
244Ø DATA WØØ5&ØØ1Y62O36Ø9W8O5X5&ØØØ63B
245Ø DATA OØØ1QØØØOXW$Ø<W3OØC<LS1Ø3X8B9
246Ø DATA Ø8ØPØØG1&ØØW6WØ21928Y8!8O622C
247Ø DATA 62928YGYWIW6WØ4ØQØØW1!Ø2Ø685A
248Ø DATA ØGØOWØ<XP1~WM4LWØØE64ØØ3YGWCF
249Ø DATA ØØ^=4ØØE92ØØ1&GØØ6XØØ1MØØ6O1D
25ØØ DATA ;1~|*Ø355?4Ø68ØGØ]MØ4Ø6&ØG1CD
251Ø DATA OW1Ø5YØ4Ø-4W1ØHYØ42E4W111YØ47
252Ø DATA 48E4W141YØ4WE4W1G1YØ6Ø68ØGØ14
253Ø DATA OWØ11XGØØ8QX4A4&96F]5.1;Ø5_E2
254Ø DATA ØØ54Ø366ØØØYK~{D.{Ø465ØØØX!95
255Ø DATA WØ1HSØ1U3]5.ØØH(4&&HØXLV6Ø1D8
256Ø DATA 2ØØ;KØØ;]ØØ;KØØGWØC4GØBEØ315F
257Ø DATA 4Ø12ØØJØØØ1A
```

Prime Numbers

Listing 1

```
1Ø REM Prime Numbers
2Ø REM Lucas-Lehmer prime test
3Ø REM by Susan Stepney
4Ø REM for B/B+/M/C/E/A
5Ø REM (c) BAU June 1991
6Ø :
7Ø MODE Ø
8Ø maxp%=1ØØØ
9Ø maxplen%=maxp% DIV 8
1ØØ DIM ek%   maxplen%
11Ø DIM a%    maxplen%
12Ø DIM b%    maxplen%
13Ø DIM Mp2% maxplen%
14Ø p%=3
15Ø :
16Ø REPEAT
17Ø p%=FNnextprime(p%)
18Ø PRINT "2^";p%;"-1 is ";
19Ø time=TIME
2ØØ length%=p% DIV 8
21Ø :
22Ø REM -- topMp1 = topbyte of Mp+1 = 1ØØØ...
23Ø REM -- topMp  = topbyte of Mp   = Ø111...
24Ø :
25Ø topMp1%=2^(p% MOD 8)
26Ø topMp% =topMp1%-1
27Ø :
28Ø REM -- Mp2=Mp-2
29Ø :
3ØØ FOR I%=Ø TO length%-1
31Ø Mp2%?I%=255
32Ø NEXT I%
33Ø :
34Ø Mp2%?length%=topMp%
35Ø Mp2%?Ø=Mp2%?Ø-2
36Ø :
37Ø REM -- ek=4
38Ø :
39Ø PROCsetzero(ek%)
4ØØ ek%?Ø=4
41Ø :
42Ø REM -- calculate e(p-1)
43Ø :
44Ø FOR K%=2 TO p%-1
45Ø PROCcopy(a%,ek%)
46Ø PROCcopy(b%,ek%)
47Ø PROCsetzero(ek%)
48Ø :
49Ø REPEAT
5ØØ IF b%?Ø MOD 2=1 THEN PROCadd(ek%,a%):PROCmod(ek%)
51Ø PROChalve(b%)
52Ø PROCdouble(a%)
53Ø PROCmod(a%)
54Ø UNTIL FNtestzero(b%)
55Ø :
56Ø PROCadd(ek%,Mp2%): PROCmod(ek%)
57Ø NEXT K%
58Ø IF FNtestzero(ek%) THEN PRINT "prime     "; ELSE PRINT "composite ";
59Ø time=(TIME-time)*Ø.Ø1
6ØØ PRINT"t = ";time;" seconds;  t/p^3 = ";time/p%^3
61Ø UNTIL p%=maxp%
62Ø END
63Ø :
64Ø REM a=a+b
65Ø :
66Ø DEF PROCadd(a%,b%)
67Ø LOCAL sum%,carry%
68Ø carry%=Ø
69Ø :
7ØØ FOR I%=Ø TO length%
71Ø sum%=a%?I%+b%?I%+carry%
72Ø IF sum%>255 THEN a%?I%=sum% MOD 256:carry%=1 ELSE a%?I%=sum%:carry%=Ø
73Ø NEXT I%
74Ø IF carry%>Ø THEN PRINT'"overflow":STOP
75Ø ENDPROC
76Ø :
77Ø REM a=Ø
78Ø :
79Ø DEF PROCsetzero(a%)
8ØØ FOR I%=Ø TO length%
81Ø a%?I%=Ø
82Ø NEXT I%
83Ø ENDPROC
84Ø :
85Ø REM a=b
86Ø :
87Ø DEF PROCcopy(a%,b%)
88Ø FOR I%=Ø TO length%
89Ø a%?I%=b%?I%
9ØØ NEXT I%
91Ø ENDPROC
92Ø :
93Ø REM a=a DIV 2
94Ø :
95Ø DEF PROChalve(a%)
96Ø IF length%=Ø THEN a%?Ø=a%?Ø DIV 2:ENDPROC
97Ø FOR I%=Ø TO length%-1
98Ø a%?I%=a%?I% DIV 2+a%?(I%+1)MOD 2*128
99Ø NEXT I%
1ØØØ a%?length%=a%?length% DIV 2
1Ø1Ø ENDPROC
1Ø2Ø :
1Ø3Ø REM a=a*2
1Ø4Ø :
1Ø5Ø DEF PROCdouble(a%)
1Ø6Ø IF a%?length%>=128 THEN PRINT'"overflow":STOP
1Ø7Ø IF length%=Ø THEN a%?Ø=a%?Ø*2:ENDPROC
1Ø8Ø FOR I%=length% TO 1 STEP -1
1Ø9Ø a%?I%=(a%?I%*2) MOD 256+a%?(I%-1) DIV 128
11ØØ NEXT I%
111Ø a%?Ø=a%?Ø*2
112Ø ENDPROC
113Ø :
114Ø REM a=a MOD Mp
```

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◀ Continued

```
1150 :
1160 DEF PROCmod(a%)
1170 LOCAL all%, topbit%,sum%,carry%
1180 IF (a%?length% AND topMp1%)=0 THEN
topbit%=0:all%=FNallset(a%) ELSE topbit
%=1
1190 IF topbit%=0 AND NOT all% THEN END
PROC
1200 carry%=1
1210 :
1220 FOR I%=0 TO length%
1230 sum%=a%?I%+carry%
1240 IF sum%>255 THEN a%?I%=sum% MOD 25
6:carry%=1 ELSE a%?I%=sum%:carry%=0
1250 NEXT I%
1260 a%?length%=a%?length%-topMp1%
1270 ENDPROC
1280 :
1290 REM = TRUE if a=zero
1300 :
1310 DEF FNtestzero(a%)
1320 LOCAL zero%
1330 zero%=TRUE
1340 I%=0
1350 :
1360 REPEAT
1370 IF a%?I%<>0 THEN zero%=FALSE
1380 I%=I%+1
1390 UNTIL I%>length% OR NOT zero%
1400 =zero%
1410 :
1420 REM =TRUE if all p bits set to 1
1430 :
1440 DEF FNallset(a%)
1450 LOCAL unset%
1460 :
1470 REM -- check top byte
1480 :
1490 IF a%?length% <> topMp% THEN=FALSE
1500 IF length%=0 THEN=TRUE
1510 unset%=FALSE
1520 L%=0
1530 REPEAT
1540 IF a%?L%<>255 THEN unset%=TRUE
1550 L%=L%+1
1560 UNTIL unset% OR L%=length%
1570 =NOT unset%
1580 :
1590 REM Return next prime bigger than
p
1600 :
1610 DEF FNnextprime(p%)
1620 LOCAL prime%,test%
1630 REPEAT
1640 p%=p%+2
1650 prime%=TRUE
1660 test%=1
1670 REPEAT
1680 test%=test%+2
1690 IF p% MOD test%=0 THEN prime%=FALS
E
1700 UNTIL NOT prime% OR test%*test%>p%
1710 UNTIL prime%
1720 =p%
```

Gwawp

Listing 1

```
10 REM >Gwawp
20 REM By Dave Lawrence
30 REM For Archimedes only
40 REM (c) BAU June 1991
50 :
60 ON ERROR PROCerror
70 MODE 13
80 PROCcode
90 PROCdraw13
100 CALL convertto9
110 MODE 9:OFF
120 PROCinit9
130 CALLdisplay9
140 PROCanimate9
150 END
160 :
170 DEF PROCerror
180 IF ERR=17 AND NOT INKEY-2 RUN
190 MODE 0
200 IF ERR<>17 PRINTREPORT$;" at line
";ERL
210 END
220 :
230 DEF PROCcode
240 xcent=1
250 ycent=2
260 r=3
270 add=4
280 x=5
290 y=6
300 p=7
310 xstart=8
320 xend=9
330 yline=10
340 addr=11
350 scrn=12
360 sp=13
370 link=14
380 DIM code 1000,Memory 320*256
390 FOR I%=0 TO 2 STEP 2
400 P%=code
410 [OPT I%
420 :
430 .circle
440 STMFD (sp)!,{link}
450 BL getparams
460 CMP R0,#4
470 BNE badcall
480 LDMIA addr,{R1-R4}
490 LDR scrn,screen
500 MOV x,#0
510 MOV y,r
520 MOV r,r,ASL #1
530 RSB p,r,#3
540 RSB ycent,ycent,#255
550 :
560 .main
570 SUB yline,ycent,x
580 SUB xstart,xcent,y
590 ADD xend,xcent,y
600 BL line
610 CMP x,#0
620 BEQ nolower
630 ADD yline,ycent,x
640 SUB xstart,xcent,y
650 ADD xend,xcent,y
660 BL line
670 :
680 .nolower
690 CMP x,y
700 LDMGEFD (sp)!,{PC}
710 CMP p,#0
720 ADD p,p,x,ASL #2
730 ADD x,x,#1
740 ADD p,p,#6
750 BMI main
760 SUB p,p,y,ASL #2
770 ADD p,p,#4
780 SUB x,x,#1
790 SUB yline,ycent,y
800 SUB xstart,xcent,x
810 ADD xend,xcent,x
820 BL line
830 SUB xstart,xcent,x
840 ADD xend,xcent,x
850 ADD yline,ycent,y
860 BL line
870 ADD x,x,#1
880 SUB y,y,#1
890 CMP x,y
900 LDMGTFD (sp)!,{PC}
910 B main
920 :
930 .line
940 CMP yline,#256
950 MOVCS pc,link
960 CMP xstart,#0
970 MOVLT xstart,#0
980 CMP xend,#320
990 MOVGE xend,#320
1000 SUBGE xend,xend,#1
1010 ADD addr,scrn,yline,ASL #6
1020 ADD addr,addr,yline,ASL #8
1030 :
1040 .plotline
1050 LDRB R0,[addr,xstart]
1060 ADD R0,R0,add
1070 STRB R0,[addr,xstart]
1080 ADD xstart,xstart,#1
1090 CMP xstart,xend
1100 BLE plotline
1110 MOV pc,link
1120 :
1130 .convertto9
1140 STMFD (sp)!,{link}
1150 LDR R10,screen
1160 LDR R11,memory
1170 MOV y,#256
1180 :
1190 .cyloop
1200 MOV x,#320
1210 :
1220 .cxloop
1230 LDRB R0,[R10],#1
1240 BL trans
1250 MOV R1,R0
1260 LDRB R0,[R10],#1
1270 BL trans
1280 ORR R0,R1,R0,ASL #4
1290 STRB R0,[R11],#1
1300 SUBS x,x,#2
1310 BNE cxloop
1320 SUBS y,y,#1
1330 BNE cyloop
1340 LDMFD (sp)!,{pc}
1350 :
1360 .trans
1370 MOV R0,R0,LSR #1
1380 AND R0,R0,#&F
1390 MOV pc,link
1400 :
1410 .display9
1420 LDR R10,screen
1430 LDR R11,memory
1440 MOV R1,#320*256/2/4
1450 :
1460 .d9loop
1470 LDR R0,[R11],#4
1480 STR R0,[R10],#4
1490 SUBS R1,R1,#1
1500 BNE d9loop
1510 MOV pc,link
1520 :
1530 .getparams
1540 ADR addr,reggies
1550 ADD addr,addr,R10,ASL #2
1560 MOVS R0,R10
1570 BEQ noneparams
1580 :
1590 .gploop
1600 LDMIA R9!,{R1,R2}
1610 CMP R2,#4
1620 BNE badcall
1630 LDR R1,[R1]
1640 STMDB (addr)!,{R1}
1650 SUBS R10,R10,#1
1660 BNE gploop
1670 :
1680 .noneparams
1690 MOV pc,link
1700 :
1710 .badcall
1720 ADR R0,bcmess
1730 SWI "OS_GenerateError"
1740 :
1750 .bcmess
1760 EQUD 0
1770 EQUS "Bad call"+CHR$0
1780 ALIGN
1790 :
1800 .reggies
1810 EQUD 0:EQUD 0:EQUD 0:EQUD 0
1820 EQUD 0:EQUD 0:EQUD 0:EQUD 0
1830 :
1840 .screen
1850 EQUD 148:EQUD -1
1860 .memory
1870 EQUD Memory
1880 :
1890 ]NEXT
1900 SYS "OS_ReadVduVariables",screen,s
creen
1910 ENDPROC
1920 :
1930 DEF PROCdraw13
1940 INPUT"How many circles <1024 OR Re
turn : "circles
1950 CLS:OFF
1960 IF circles=0 THEN
1970 R=0
1980 *POINTER 1
1990 REPEAT
2000 MOUSE X,Y,Z
2010 IF Z AND 4 PROClots(X/4,Y/4,R,1):R
+=1
2020 IF Z AND 1 PROClots(X/4,Y/4,R,-1):
R+=1
2030 IF Z=0 R=0
2040 UNTIL Z AND 2
2050 *POINTER 0
2060 ELSE
2070 radius=2^(2*(5-(LNcircles/LN2+2)/3
)+1)
2080 FOR i=1 TO circles
2090 PROClots(RND(320)-1,RND(256)-1,RND
(radius)+radius/2,SGNRND*RND(4))
2100 NEXT
2110 ENDIF
2120 ENDPROC
2130 :
2140 DEF PROClots(xc,yc,rad,add)
2150 REPEAT
2160 PROCcircle(xc,yc,rad,add)
2170 rad-=1
2180 UNTIL rad<0
2190 ENDPROC
2200 :
2210 DEF PROCcircle(xc%,yc%,rad%,add%)
2220 CALL circle,xc%,yc%,rad%,add%
2230 ENDPROC
2240 :
2250 DEF PROCinit9
2260 DIM c(15)
2270 DIM bcol(2),fcol(2)
2280 DIM newbcol(2),newfcol(2)
2290 DIM bcolstep(2),fcolstep(2)
2300 c()=0,2,4,6,8,10,12,14,15,13,11,9,
7,5,3,1
2310 FOR i=0 TO 15
2320 c(i)=c(i)/15
2330 NEXT
2340 bcol()=0,0,0
2350 fcol()=1,1,1
2360 col   =0
2370 steps =256
2380 ENDPROC
2390 :
2400 DEF PROCanimate9
2410 REPEAT
2420 newbcol()=RND(1),RND(1),RND(1)
2430 newfcol()=RND(1),RND(1),RND(1)
2440 FOR part=0 TO 2
2450 bcolstep(part)=(newbcol(part)-bcol
(part))/steps
2460 fcolstep(part)=(newfcol(part)-fcol
(part))/steps
2470 NEXT
2480 FOR step=0 TO steps
2490 i=col
2500 WAIT
2510 FOR c=0 TO 15
2520 VDU 19,c,16
2530 FOR part=0 TO 2
2540 VDU 255*(bcol(part)+(fcol(part)-bc
ol(part))*c(i))
2550 NEXT
2560 i=(i+1) MOD 16
2570 NEXT
2580 fcol()=fcol()+fcolstep()
2590 bcol()=bcol()+bcolstep()
2600 col=(col+1) MOD 16
2610 NEXT
2620 bcol()=newbcol()
2630 fcol()=newfcol()
2640 UNTIL FALSE
2650 ENDPROC
```

Gobble

Listing 1

```
10 REM >GOBBLE
20 REM Evolution Simulation
30 REM for Arc Only
40 REM by T K Boyd
50 REM (c) BAU June 91
60 :
70 PROCinitialise
80 :
90 DEF PROCa(x,y)
100 PLOT 69,x*xscale,y*yscale
110 ENDPROC
120 :
130 DEF FNpnt(X,Y)
140 =(POINT(X*xscale,Y*yscale)=cal)
150 :
160 DEF PROCelimold
170 LOCALc1
180 c1=pcp+1
190 IF c1>nst THEN c1=0
200 PROCplotbugs(c1,ca0)
210 ENDPROC
220 :
230 DEF PROCmainengine
240 LOCAL c1,c2,done,bug,X,Y,deadbugs
250 GCOL 0,ca0
260 deadbugs=FALSE
270 bug=-1
280 nb(pcp)=nb(ppp)
290 :
300 REPEAT
310 bug=bug+1
320 IF fer(bug)<fvs THEN x(pcp*nbmaxp1
+bug)=x(ppp*nbmaxp1+bug):y(pcp*nbmaxp1+b
ug)=y(ppp*nbmaxp1+bug):GOTO540
330 c1=RND(255)
340 c2=0
350 done=FALSE
360 :
370 REPEAT
380 IF c1<g(c2,bug) THEN done=TRUE
390 IF done=FALSE THEN c2=c2+1
400 UNTIL done OR c2=mmax
410 :
420 d(bug)=d(bug)+c2
430 IF d(bug)>mmax THEN d(bug)=d(bug)-
mmaxP1
440 X=x(ppp*nbmaxp1+bug)+mx(d(bug))
450 IF X>xmax THEN X=X-xmaxP1
460 IF X<0 THEN X=X+xmaxP1
470 x(pcp*nbmaxp1+bug)=X
480 Y=y(ppp*nbmaxp1+bug)+my(d(bug))
490 IF Y>ymax THEN Y=Y-ymaxP1
500 IF Y<0 THEN Y=ymax
510 y(pcp*nbmaxp1+bug)=Y
520 :
530 IF FNpnt(X,Y)=TRUE  THEN fer(bug)=
fer(bug)+fvf:PROCa(X,Y)
```

Continued ▶



◀ Continued

```
 540 IF FNpnt(X,Y)=FALSE THEN fer(bug)=
fer(bug)-1
 550 IF fer(bug)<1 THEN deadbugs=TRUE:G
OTO750
 560 IF fer(bug)>fvmax THEN fer(bug)=fv
max
 570 age(bug)=age(bug)+1
 580 IF age(bug)>ar THEN age(bug)=ar
 590 IF age(bug)<ar THEN 750
 600 IF fer(bug)<fvr THEN 750
 610 IF nb(pcp)=nbmax THEN 750
 620 nb(pcp)=nb(pcp)+1
 630 x(ppp*nbmaxp1+nb(pcp))=X
 640 y(ppp*nbmaxp1+nb(pcp))=Y
 650 age(bug)=0
 660 age(nb(pcp))=0
 670 fer(bug)=fer(bug)/2.5
 680 fer(nb(pcp))=fer(bug)
 690 d(nb(pcp))=(d(bug)+mmax) MOD mmax
 700 FOR c1=0 TO mmax-1
 710 g(c1,nb(pcp))=g(c1,bug)
 720 NEXT
 730 :
 740 PROCmutate(nb(pcp))
 750 UNTIL bug=nb(pcp)
 760 IF deadbugs=FALSE THEN ENDPROC
 770 c1=-1
 780 :
 790 REPEAT
 800 c1=c1+1
 810 IF fer(c1)<0 THEN
 820 x(pcp*nbmaxp1+c1)=x(pcp*nbmaxp1+nb
(pcp))
 830 y(pcp*nbmaxp1+c1)=y(pcp*nbmaxp1+nb
(pcp))
 840 d(c1)=d(nb(pcp))
 850 fer(c1)=fer(nb(pcp))
 860 age(c1)=age(nb(pcp))
 870 :
 880 FOR c2=0 TO mmax-1
 890 g(c2,c1)=g(c2,nb(pcp))
 900 NEXT
 910 c1=c1-1
 920 nb(pcp)=nb(pcp)-1
 930 ENDIF
 940 UNTIL c1=nb(pcp)
 950 ENDPROC
 960 :
 970 DEF PROCmutate(N)
 980 LOCAL B,inr,c1,adj
 990 B=RND(mmaxP1)-1
1000 w(0)=g(0,N)
1010 :
1020 FOR c1=1 TO mmaxm1
1030 w(c1)=g(c1,N)-g(c1-1,N)
1040 NEXT
1050 :
1060 w(mmax)=kg1-g(mmaxm1,N)
1070 inr=INT(w(B)*1.6)
1080 w(B)=w(B)+inr
1090 adj=(kg1p1+inr)/kg1p1
1100 g(0,N)=INT(w(0)/adj)
1110 IFg(0,N)=0 THEN g(0,N)=1
1120 :
1130 FOR c1=1 TO mmaxm1
1140 g(c1,N)=g(c1-1,N)+INT(w(c1)/adj)
1150 IF g(c1,N)<=g(c1-1,N) THEN g(c1,N)
=g(c1,N)+1
1160 NEXT
1170 :
1180 IF g(mmaxm1,N)<kg1 THEN ENDPROC
1190 c1=mmaxm1
1200 g(c1,N)=kg1-1
1210 :
1220 REPEAT
1230 IF g(c1-1,N)<g(c1,N) THEN ENDPROC
1240 g(c1-1,N)=g(c1,N)-1
1250 c1=c1-1
1260 UNTIL FALSE
1270 ENDPROC
1280 :
1290 DEF PROCrotatcol
1300 LOCAL c1,T
1310 T=ct(nst)
1320 FOR c1=nst-1 TO 0 STEP-1
1330 ct(c1+1)=ct(c1)
1340 NEXT
1350 ct(0)=T
1360 PROCcolours
1370 ENDPROC
1380 :
1390 DEF PROCplotbugs(offset,col)
1400 LOCAL c1,c2,X,Y,x1,y1,XT
1410 GCOL0,col
1420 c1=nbmaxp1*offset
1430 :
1440 FOR c2=c1 TO c1+nb(offset)
1450 X=x(c2)
1460 Y=y(c2)
1470 PROCa(X,Y)
1480 x1=X-1
1490 IF X=0 THEN x1=xmax
1500 XT=x1
1510 PROCa(x1,Y)
1520 y1=Y-1
1530 IF Y=0 THEN y1=ymax
1540 PROCa(x1,y1)
1550 PROCa(X,y1)
1560 x1=X+1
1570 IF X=xmax THEN x1=0
1580 PROCa(x1,y1)
1590 PROCa(x1,Y)
1600 y1=Y+1
1610 IF Y=ymax THEN y1=0
1620 PROCa(x1,y1)
1630 PROCa(X,y1)
1640 PROCa(XT,y1)
1650 NEXT
1660 ENDPROC
1670 :
1680 DEF PROCnewfood(amount,kfg)
1690 IF kfg>1 THEN PROCnotvalid
1700 LOCAL c1,X,Y
1710 GCOL 0,1
1720 IF kfg=0 THEN
1730 FOR c1=0 TO amount
1740 PROCa(RND(xmax),RND(ymax))
1750 NEXT
1760 ELSE
1770 FOR c1=0 TO amount
1780 X=RND(xmax/2)+RND(xmax/4)+RND(xmax
/8)
1790 Y=RND(ymax/2)+RND(ymax/4)+RND(ymax
/8)
1800 PROCa(X,Y)
1810 NEXT
1820 ENDPROC
1830 :
1840 DEF PROCnotvalid
1850 PRINT"Only kfg 0 and 1 currently v
alid."
1860 kfg=0
1870 ENDPROC
1880 :
1890 DEF PROCcolours
1900 FOR c1=0 TO nst
1910 VDU 19,ct(c1),ca(c1+2);0;0;
1920 NEXT
1930 ENDPROC
1940 :
1950 DEF PROCinitialise
1960 xmax=255
1970 ymax=255
1980 xmaxP1=xmax+1
1990 ymaxP1=ymax+1
2000 mmax=5
2010 mmaxP1=mmax+1
2020 mmaxm1=mmax-1
2030 kg1=255:kg1p1=kg1+1
2040 kfg=1
2050 pcp=0
2060 xscale=4:yscale=4
2070 nbmax=30
2080 nbmaxp1=nbmax+1
2090 nb=7
2100 IF nb>=nbmax THEN PRINT"Asked for
too many bugs.":STOP
2110 nst=4
2120 fvr=250
2130 fvs=8
2140 fvmax=fvr*1.3
2150 fvf=24
2160 ar=200
2170 :
2180 DIM x(nbmaxp1*nst+nbmax),y(nbmaxp1
*nst+nbmax)
2190 DIM mx(mmax),my(mmax)
2200 DIM w(mmax)
2210 DIM nb(nst)
2220 nb(0)=nb
2230 DIM fer(nbmax)
2240 DIM ct(nst),ca(nst+2)
2250 DIM age(nbmax)
2260 DIM g(mmax-1,nbmax)
2270 DIM d(nbmax)
2280 :
2290 FOR c1=0 TO nb
2300 x(c1)=RND(xmax)
2310 y(c1)=RND(ymax)
2320 age(c1)=ar/2+RND((ar-1)/2)
2330 fer(c1)=fvmax/2+RND(fvmax/2)
2340 d(c1)=RND(mmaxP1)-1
2350 g(0,c1)=2*kg1/mmaxP1
2360 :
2370 FOR c2=1 TO mmax-1
2380 g(c2,c1)=g(c2-1,c1)+(kg1/mmaxP1/2)
-10+RND(10)
2390 NEXTc2,c1
2400 nb(0)=nb
2410 :
2420 FOR c1=1 TO nst
2430 nb(c1)=0
2440 NEXTc1
2450 :
2460 RESTORE2500
2470 :
2480 REM Physical colours for empty spo
t,food,current posn, prev.posn, one befo
re that, etc.
2490 :
2500 DATA 0,1,2,3,6,7,4,5
2510 :
2520 FOR c1=0 TO nst+2
2530 READ ca(c1)
2540 NEXT c1
2550 ca0=ca(0)
2560 ca1=ca(1)
2570 ct(0)=2
2580 FOR c1=1 TO nst
2590 ct(c1)=nst++3-c1
2600 NEXT
2610 VDU 19,0,ca0;0;0;19,1,ca1;0;0;
2620 PROCcolours
2630 :
2640 RESTORE 2690
2650 FOR c1=0 TO mmax
2660 READ mx(c1),my(c1)
2670 NEXT
2680 :
2690 DATA 0,2,2,1,2,-1,0,-2,-2,-1,-2,1
2700 DATA 4,0,4,0,4,0,4,0,4,0,4,0
2710 DATA 2,-2,2,2,2,-2,2,2,0,0,-2,2
2720 :
2730 PROCdisplay
2740 :
2750 REPEAT
2760 PROCelimold
2770 PROCrotatcol
2780 pcp=pcp+1
2790 IF pcp>nst THENpcp=0
2800 ppp=pcp-1
2810 IF pcp=0 THEN ppp=nst
2820 PROCmainengine
2830 PROCnewfood(xmax*ymax/4000,kfg)
2840 PROCplotbugs(pcp,ct(0))
2850 WAIT
2860 UNTILFALSE
2870 END
2880 :
2890 DEF PROCdisplay
2900 MODE 9
2910 PROCnewfood(xmax*ymax/100,kfg)
2920 PROCplotbugs(0,ct(0))
2930 OFF
2940 ON ERROR PROCend
2950 ENDPROC
2960 :
2970 DEF PROCend
2980 IF ERR=15 THEN PRINTTAB(6,6)"EXTIN
CTION IS FOREVER!!"'''"        Press any
key":A$=GET$:RUN
2990 REPORT:PRINT" At Line ";ERL:ON
3000 END
```

Pieces of 8

Listing 1

```
  10 REM 3DLife (Po81)
  20 REM By Malcolm Banthorpe
  30 REM For BBC B/B+/M/C/E/A
  40 REM (c) BAU June 1991
  50 :
  60 MODE1:VDU 29,640;400;
  70 VDU 23;8202;0;0;0;
  80 VDU19,1,1;0;19,2,5;0;19,3,3;0;
  90 Angle=30
 100 Sin=SINRAD-Angle:Cos=COSRAD-Angle
 110 DIMArray%3375:VZ%=-2000:S%=1600
 120 FORI%=0TO3374:I%?Array%=0:NEXT
 130 PROCdesign
 140 G%=1:colour=3
 150 PROCshow
 160 PROCmain:END
 170 :
 180 DEF PROCmain
 190 C=2
 200 REPEAT
 210 G%=G%+1
 220 C=C+1:colour=C MOD3+1
 230 FORX%=7-G%TO7+G%
 240 FORY%=7-G%TO7+G%
 250 FORZ%=7-G%TO7+G%
 260 count%=0
 270 FORx%=X%-1TOX%+1STEP2
 280 FORy%=Y%-1TOY%+1STEP2
 290 FORz%=Z%-1TOZ%+1STEP2
 300 PROCcount(x%,y%,z%)
 310 NEXT
 320 NEXT
 330 NEXT
 340 thiscell%=FNread(X%,Y%,Z%)
 350 IFthiscell%=colour PROCwrite(X%,Y%
,Z%,0)
 360 IFthiscell%=0 THEN IF count%=1 PRO
Cwrite(X%,Y%,Z%,colour)
 370 NEXT
 380 NEXT
 390 NEXT
 400 PROCshow
 410 UNTILG%=7
 420 ENDPROC
 430 :
 440 DEF PROCcount(X%,Y%,Z%)
 450 T%=FNread(X%,Y%,Z%)
 460 IF T%>0 THEN IF T%<>colour count%=
count%+1
 470 ENDPROC
 480 :
 490 DEF PROCplot(K%,X%,Y%,Z%) LOCALx%,
y%,z%
 500 x%=X%*Cos-Z%*Sin:z%=Z%*Cos+X%*Sin
 510 y%=Y%*Cos-z%*Sin:z%=z%*Cos+Y%*Sin
 520 M=S%/(z%-VZ%):PLOTK%,x%*M,y%*M
 530 ENDPROC
 540 :
 550 DEF PROCside(X%,Y%,Z%)
 560 RESTORE570:PROCfacet(0)
 570 DATA4,0,0,0, 4,0,0,100, 85,0,100,0
, 85,0,100,100
 580 DATA5,0,100,0, 5,0,0,0, 5,0,0,100,
 5,0,100,100
 590 ENDPROC
 600 :
 610 DEF PROCfront(X%,Y%,Z%)
 620 RESTORE630:PROCfacet(C)
 630 DATA4,0,0,0, 4,100,0,0, 85,0,100,0
, 85,100,100,0
 640 DATA5,0,100,0, 5,0,0,0, 5,100,0,0,
 5,100,100,0
 650 ENDPROC
 660 :
 670 DEF PROCtop(X%,Y%,Z%)
 680 RESTORE690:PROCfacet(C)
 690 DATA4,0,0,0, 4,0,0,100, 85,100,0,0
, 85,100,0,100
 700 DATA5,100,0,0, 5,0,0,0, 5,0,0,100,
 5,100,0,100
 710 ENDPROC
 720 :
 730 DEF PROCfacet(N)
 740 GCOL 0,N
 750 FORI%=1TO4:READK%,A%,B%,C%
 760 PROCplot(K%,X%+A%,Y%+B%,Z%+C%)
 770 NEXT
 780 GCOL 0,C EOR N
 790 FORI%=1TO4:READK%,A%,B%,C%
 800 PROCplot(K%,X%+A%,Y%+B%,Z%+C%)
 810 NEXT
 820 ENDPROC
 830 :
 840 DEF PROCcube(X%,Y%,Z%,C)
 850 PROCfront(X%,Y%,Z%)
 860 PROCside(X%+100,Y%,Z%)
 870 PROCtop(X%,Y%+100,Z%)
 880 ENDPROC
 890 :
 900 DEFFNread(X%,Y%,Z%)=Array%?(X%+(Y%
+Z%*15)*15)
 910 :
 920 DEF PROCwrite(X%,Y%,Z%,N%)
 930 Array%?(X%+(Y%+Z%*15)*15)=N%
 940 ENDPROC
 950 :
 960 DEF PROCshow
 970 CLS
 980 FORZ%=7+G%TO7-G%STEP-1
 990 FORY%=7-G%TO7+G%
1000 FORX%=7-G%TO7+G%
1010 T%=FNread(X%,Y%,Z%)
1020 IFT%<>0PROCcube(X%*100-700,Y%*100-
700,Z%*100-700,T%)
1030 NEXT
1040 NEXT
1050 NEXT
1060 PRINTTAB(2,28);"Generation ";G%
1070 ENDPROC
1080 :
1090 DEF PROCdesign
1100 RESTORE1140
1110 READN%:FORI%=1TON%
1120 READX%,Y%,Z%:PROCwrite(X%,Y%,Z%,3)
1130 NEXT
1140 DATA 1
1150 DATA 7,7,7
1160 ENDPROC
```

Listing 2 (Changes)

```
DELETE 270,330

  270FORy%=Y%-1TOY%+1STEP2
  275PROCcount(X%,y%,Z%)
  280NEXT
  285FORx%=X%-1TOX%+1STEP2
  290PROCcount(x%,Y%,Z%)
  295NEXT
  300FORz%=Z%-1TOZ%+1STEP2
  305PROCcount(X%,Y%,z%)
  310NEXT
  360IFthiscell%=0 THEN IF count%MOD2=1
PROCwrite(X%,Y%,Z%,colour)
 1140DATA 6
 1150DATA 7,7,6, 7,7,8, 7,6,7, 7,8,7,
6,7,7, 8,7,7
```

Listing 3

```
  10 REM Fills (Po83)
  20 REM By Peter Sanford
  30 REM For BB/B/B+/M/C/E
  40 REM (C) BAU June 1991
  50 IF PAGE<&1900 PRINT "PAGE must be
set to at least &1900":END
```

Continued ▶

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```
60 :
70 MODE 7
80 PROCinit
90 PROCassemble
100 IF colfill PROCchecksum(&1380E) ELSE PROCchecksum(&13215)
110 IF colfill PROCcolours ELSE PROCtones
120 OSCLI"Save "+file$+" "+STR$~code+" +300"
130 PRINT"File '";file$;"' saved at &";~code
140 END
150 :
160 DEF PROCinit
170 PRINT"(D)otFill or (C)olFill : ";
180 REPEAT
190 key$=GET$
200 key=INSTR("DdCc",key$)
210 UNTILkey>0
220 IF key<3 file$="DotFill":colfill=FALSE ELSE file$="ColFill":colfill=TRUE
230 PRINTfile$
240 xlo=&70
250 xhi=&71
260 ylo=&72
270 yhi=&73
280 newx=&74
290 newy=&76
300 tox=&78
310 bitmap=&7A
320 mask=&7B
330 xstep=&7C
340 xshift=&7D
350 pattern=&7E
360 first=&80
370 last=&82
380 flag=&84
390 leftx=&88
400 rightx=&8C
410 oldx=&8E
420 workspace=&1100
430 code=&1200
440 osbyte=&FFF4
450 oswrch=&FFEE
460 READ ntones,ncols
470 IF colfill ntones=ncols
480 ENDPROC
490 :
500 DEF PROCassemble
510 PRINT"Assembling..."
520 FOR pass=0 TO 2 STEP 2
530 P%=code
540 [OPT pass
550 .dotfill
560 LDA #6
570 STA &71
580 LDA #0
590 STA &70
600 LDY #9
610 .copyparam
620 LDA (&70),Y
630 STA &80,Y
640 DEY
650 BPL copyparam
660 LDA &80
670 CMP #3
680 BNE badcall
690 LDA &83
700 CMP #4
710 BNE badcall
720 LDA &86
730 CMP #4
740 BNE badcall
750 LDA &89
760 CMP #4
770 BEQ paramok
780 .badcall
790 BRK
800 EQUB 45
810 EQUS "CALL Parameters"+CHR$0
820 .paramok
830 LDY #1
840 .storeparam
850 LDA (&81),Y
860 STA xlo,Y
870 LDA (&84),Y
880 STA ylo,Y
890 DEY
900 BPL storeparam
910 INY
920 LDA (&87),Y
930 BMI badcall
940 CMP #ntones
950 BCS badcall
960 ]
970 IF colfill PROCcol1 ELSE PROCdot1
980 [OPT pass
990 LDA #&87
1000 JSR osbyte
1010 TYA
1020 CMP #3
1030 BCC mode012
1040 BEQ badmode
1050 CMP #6
1060 BCC mode45
1070 .badmode
1080 BRK
1090 EQUB 46
1100 EQUS "Not graphics mode"+CHR$0
1110 .mode45
1120 SEC
1130 SBC #3
1140 .mode012
1150 STA xshift
1160 TAX
1170 LDA #1
1180 .setxstep
1190 ASL A
1200 DEX
1210 BPL setxstep
1220 STA xstep
1230 LDA #9
1240 JSR osword
1250 LDA &74
1260 BEQ ok2
1270 RTS
1280 .ok2
1290 LDA #0
1300 STA flag
1310 STA first
1320 STA last
1330 LDA #workspace DIV 256
1340 STA first+1
1350 STA last+1
1360 JSR linefill
1370 JSR copylimits
1380 JSR incy
1390 JSR queue
1400 JSR decy
1410 JSR decy
1420 JSR invertflag
1430 JSR queue
1440 .startloop
1450 JSR unqueue
1460 .nextline
1470 BIT &FF
1480 BPL noesc
1490 LDA #&7E
1500 JSR osbyte
1510 RTS
1520 .noesc
1530 LDA #9
1540 JSR osword
1550 LDA &74
1560 BMI checkendoffill
1570 BEQ background
1580 JSR findback
1590 STA xlo
1600 LDA newx+1
1610 STA xhi
1620 LDA xlo
1630 CMP tox
1640 BNE noteq
1650 CLC
1660 .noteq
1670 LDA xhi
1680 SBC tox+1
1690 BCS checkendoffill
1700 .background
1710 LDA xlo
1720 STA oldx
1730 LDA xhi
1740 STA oldx+1
1750 JSR linefill
1760 JSR testnewlines
1770 JSR copylimits
1780 JSR incy
1790 JMP nextline
1800 .checkendoffill
1810 LDA last
1820 CMP first
1830 BNE startloop
1840 RTS
1850 .testnewlines
1860 LDA rightx
1870 STA xlo
1880 CMP tox
1890 LDA rightx+1
1900 STA xhi
1910 SBC tox+1
1920 BCS test2
1930 JSR incx
1940 JSR findback
1950 CMP tox
1960 LDA newx+1
1970 SBC tox+1
1980 BCS test3
1990 JSR queue
2000 .test2
2010 CLC
2020 LDA tox
2030 ADC xstep
2040 STA xlo
2050 LDA tox+1
2060 STA xhi
2070 BCC t2noinc
2080 INC xhi
2090 .t2noinc
2100 JSR decy
2110 JSR findback
2120 CMP rightx
2130 LDA newx+1
2140 SBC rightx+1
2150 BCS test3
2160 JSR invertflag
2170 LDA rightx
2180 STA tox
2190 LDA rightx+1
2200 STA tox+1
2210 JSR queue
2220 JSR invertflag
2230 .test3
2240 LDA leftx
2250 CMP oldx
2260 LDA leftx+1
2270 SBC oldx+1
2280 BCS endtest
2290 LDY #3
2300 .t3loop
2310 LDA leftx,Y
2320 STA xlo,Y
2330 DEY
2340 BPL t3loop
2350 JSR decy
2360 JSR findback
2370 CMP oldx
2380 LDA newx+1
2390 SBC oldx+1
2400 BCS endtest
2410 LDA oldx
2420 STA tox
2430 LDA oldx+1
2440 STA tox+1
2450 JSR invertflag
2460 JSR queue
2470 JSR invertflag
2480 .endtest
2490 RTS
2500 .copylimits
2510 LDY #5
2520 .copyloop
2530 LDA leftx,Y
2540 STA xlo,Y
2550 STA newx,Y
2560 DEY
2570 BPL copyloop
2580 RTS
2590 .invertflag
2600 LDA flag
2610 EOR #&80
2620 STA flag
2630 RTS
2640 .queue
2650 LDA newy+1
2660 ORA flag
2670 STA newy+1
2680 LDY #5
2690 .q1
2700 LDA newx,Y
2710 STA (last),Y
2720 DEY
2730 BPL q1
2740 LDA last
2750 CLC
2760 ADC #6
2770 CMP #252
2780 BNE q2
2790 LDA #0
2800 .q2
2810 CMP first
2820 BEQ cantstore
2830 STA last
2840 .cantstore
2850 RTS
2860 .unqueue
2870 LDY #5
2880 .uq1
2890 LDA (first),Y
2900 STA newx,Y
2910 STA xlo,Y
2920 DEY
2930 BPL uq1
2940 LDA yhi
2950 TAX
2960 AND #&80
2970 STA flag
2980 TXA
2990 AND #&7F
3000 STA yhi
3010 LDA first
3020 CLC
3030 ADC #6
3040 CMP #252
3050 BNE uq2
3060 LDA #0
3070 .uq2
3080 STA first
3090 RTS
3100 .findback
3110 LDA #92
3120 JSR plot
3130 LDA #&0D
3140 JSR osword
3150 LDA newx
3160 CLC
3170 ADC xstep
3180 STA newx
3190 BCC fb2
3200 INC newx+1
3210 .fb2
3220 RTS
3230 .incy
3240 LDA ylo
3250 BIT flag
3260 BMI down
3270 .up
3280 CLC
3290 ADC #4
3300 STA ylo
3310 STA newy
3320 BCC nocarry1
3330 INC yhi
3340 INC newy+1
3350 .nocarry1
3360 RTS
3370 .down
3380 SEC
3390 SBC #4
3400 STA ylo
3410 STA newy
3420 BCS carryset
3430 DEC yhi
3440 DEC newy+1
3450 .carryset
3460 RTS
3470 .decy
3480 LDA ylo
3490 BIT flag
3500 BMI up
3510 BPL down
3520 .incx
3530 CLC
3540 LDA xlo
3550 ADC xstep
3560 STA xlo
3570 BCC incx2
3580 INC xhi
3590 .incx2
3600 RTS
3610 .linefill
3620 LDA #76
3630 JSR plot
3640 LDA #&0D
3650 JSR osword
3660 LDY #5
3670 .storelimits
3680 LDA xlo,Y
3690 STA leftx,Y
3700 DEY
3710 BPL storelimits
3720 ]
3730 IF colfill PROCcol2 ELSE PROCdot2
3740 [OPT pass
3750 .plot
3760 PHA
3770 LDA #25
3780 JSR oswrch
3790 PLA
3800 JSR oswrch
3810 LDX #0
3820 .plot2
3830 LDA &70,X
3840 JSR oswrch
3850 INX
3860 CPX #4
3870 BNE plot2
3880 RTS
3890 .osword
3900 LDX #&70
3910 LDY #0
3920 JMP &FFF1
3930 .pstore
3940 ]
3950 NEXT pass
3960 ENDPROC
3970 :
3980 DEF PROCdot1
3990 [OPT pass
4000 ASL A
4010 TAY
4020 LDA pstore,Y
4030 STA pattern
4040 INY
4050 LDA pstore,Y
4060 STA pattern+1
4070 ]
4080 ENDPROC
4090 :
4100 DEF PROCcol1
4110 [OPT pass
4120 TAY
4130 LDA pstore,Y
4140 STA pattern
4150 ]
4160 ENDPROC
4170 :
4180 DEF PROCdot2
4190 [OPT pass
4200 LDA ylo
4210 LSR A
4220 LSR A
4230 AND #3
4240 LSR A
4250 TAX
4260 LDA pattern,X
4270 BCC lohalf
4280 AND #&F0
4290 STA bitmap
4300 LSR A
4310 LSR A
4320 LSR A
4330 LSR A
4340 JMP duplicate
4350 .lohalf
4360 AND #&0F
4370 STA bitmap
4380 ASL A
4390 ASL A
4400 ASL A
4410 ASL A
4420 .duplicate
4430 ADC bitmap
4440 STA bitmap
4450 LDA xlo
4460 LDX xshift
4470 .shift
4480 LSR A
```

Continued ▶



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```
4490 DEX
4500 BPL shift
4510 AND #3
4520 TAX
4530 SEC
4540 LDA #0
4550 .rotate
4560 ROR A
4570 DEX
4580 BPL rotate
4590 STA mask
4600 .plotloop
4610 LDA bitmap
4620 AND mask
4630 BEQ noplot
4640 LDA #69
4650 JSR plot
4660 .noplot
4670 LSR mask
4680 BCC xinc
4690 LDA #&80
4700 STA mask
4710 .xinc
4720 JSR incx
4730 .checkendofline
4740 CMP &74
4750 BNE ntequal
4760 CLC
4770 .ntequal
4780 LDA xhi
4790 SBC &75
4800 BCC plotloop
4810 RTS
4820 ]
4830 ENDPROC
4840 :
4850 DEF PROCcol2
4860 [OPT pass
4870 LDA #2
4880 STA &7A
4890 .plotloop
4900 LDA ylo
4910 AND #4
4920 LSR A
4930 TAY
4940 LDA xlo
4950 LDX xshift
4960 .shift
4970 LSR A
4980 DEX
4990 BPL shift
5000 LSR A
5010 TYA
5020 ADC #0
5030 TAY
5040 LDA pattern
5050 .getcolour
5060 DEY
5070 BMI colourgot
5080 LSR A
5090 LSR A
5100 JMP getcolour
5110 .colourgot
5120 AND #3
5130 BEQ noplot
5140 TAY
5150 LDA #18
5160 JSR oswrch
5170 LDA #0
5180 JSR oswrch
5190 TYA
5200 JSR oswrch
5210 LDA #20
5220 JSR plot
5230 JSR swapx
5240 LDA #21
5250 JSR plot
5260 JSR swapx
5270 .noplot
5280 JSR incx
5290 CMP &74
5300 LDA xhi
5310 SBC &75
5320 BCS linedone
5330 .nextplot
5340 DEC &7A
5350 BNE plotloop
5360 .linedone
5370 RTS
5380 .swapx
5390 LDX #1
5400 .swapx1
5410 LDA &70,X
5420 PHA
5430 LDA &74,X
5440 STA &70,X
5450 PLA
5460 STA &74,X
5470 DEX
5480 BPL swapx1
5490 RTS
5500 ]
5510 ENDPROC
5520 :
5530 DEF PROCchecksum(sum%)
5540 PRINT"Checking..."
5550 check%=0
5560 FOR i%=code TO pstore-1
5570 check%=check%+?i%
5580 NEXT
5590 IF check%<>sum% PRINT"Checksum error":END
5600 ENDPROC
5610 :
5620 DEF PROCtones
5630 PRINT"Building tones..."
5640 RESTORE 5940
5650 FOR P%=P% TO P%+(ntones-1)*2 STEP 2
5660 B$=""
5670 T%=0
5680 FOR J%=1 TO 4
5690 READ V$
5700 B$=V$+B$
5710 NEXT
5720 FOR J%=15 TO 0 STEP-1
5730 V%=VAL(MID$(B$,J%+1,1))
5740 T%=T%+V%*(2^J%)
5750 NEXT
5760 !P%=T%
5770 NEXT
5780 ENDPROC
5790 :
5800 DEF PROCcolours
5810 PRINT"Building colours..."
5820 RESTORE 6190
5830 FOR P%=P% TO P%+ntones-1
5840 T%=0
5850 FOR J%=0 TO 3
5860 READ V%
5870 T%=T%+V%*2^(2*J%)
5880 NEXT
5890 ?P%=T%
5900 NEXT
5910 ENDPROC
5920 :
5930 DATA 24,28
5940 DATA 1111,1111,1111,1111
5950 DATA 1011,1111,1011,1111
5960 DATA 1011,1110,1011,1110
5970 DATA 0101,1010,0101,1010
5980 DATA 0001,0100,0001,0100
5990 DATA 0001,0000,0100,0000
6000 DATA 0111,1011,1101,1110
6010 DATA 1110,1101,1011,0111
6020 DATA 1001,1100,0110,0011
6030 DATA 1001,0011,0110,1100
6040 DATA 1000,0100,0010,0001
6050 DATA 0001,0010,0100,1000
6060 DATA 1010,1010,1010,1010
6070 DATA 0010,0010,0010,0010
6080 DATA 0110,0110,0110,0110
6090 DATA 0000,1111,0000,1111
6100 DATA 0110,1111,0110,1111
6110 DATA 0000,0011,0000,0011
6120 DATA 0111,1101,1110,1011
6130 DATA 0010,1000,0001,0100
6140 DATA 1100,0110,0011,0110
6150 DATA 0010,0001,0010,0100
6160 DATA 1001,0110,0110,1001
6170 DATA 0000,0111,0000,1101
6180 :
6190 DATA 3,3,3,3, 3,3,1,3, 3,1,1,3, 3,1,1,1
6200 DATA 1,1,1,1, 1,1,2,1, 1,2,2,1, 2,2,2
6210 DATA 2,2,2,2, 2,2,3,2, 2,3,3,2, 2,3,3,3
6220 DATA 3,3,0,3, 3,0,0,3, 3,1,0,3, 1,3,0,1
6230 DATA 1,1,0,1, 1,0,0,1, 1,2,0,1, 2,1,0,2
6240 DATA 2,2,0,2, 2,0,0,2, 2,3,0,2, 3,2,0,3
6250 DATA 3,2,1,3, 1,2,3,1, 2,1,3,2, 0,2,1,3
```

Listing 4

```
10 REM ColDemo (Po84)
20 REM By Peter Sandford
30 REM For BBC B/B+/M/C/E
40 REM (C) BAU June 1991
50 IF PAGE<&1900 PRINT"PAGE must be set to at least &1900":END
60 :
70 MODE 1
80 colfill=&1200
90 *Load ColFill 1200
100 FOR T%=0 TO 27
110 x%=50+400*(T% DIV 12)
120 y%=940-84*(T% MOD 12)
130 IF T%>23 y%=y%-378
140 PROCblock(x%,y%,T%)
150 NEXT
160 x%=0
170 y%=0
180 T%=4
190 CALL colfill,x%,y%,T%
200 END
210 :
220 DEF PROCblock(x%,y%,tone%)
230 GCOL 0,2
240 MOVE x%,y%
250 PLOT 1,0,72
260 PLOT 1,350,0
270 PLOT 1,0,-72
280 PLOT 1,-350,0
290 x%=x%+32
300 y%=y%+32
310 CALL colfill,x%,y%,tone%
320 VDU 5
330 GCOL 0,0
340 MOVE x%,y%
350 PRINT ;tone%
360 VDU 4
370 ENDPROC
```

Listing 5

```
10 REM DotDemo (Po85)
20 REM By Peter Sandford
30 REM For BBC B/B+/M/C/E
40 REM (C) BAU June 1991
50 IF PAGE<&1900 PRINT"PAGE must be set to at least &1900":END
60 :
70 mode=4
80 MODE mode
90 dotfill=&1200
100 *LOAD DotFill 1200
110 charwidth=16*2^(mode MOD 3)
120 FOR T%=0 TO 23
130 x%=128+200*(T% MOD6)
140 y%=200+200*(T% DIV6)
150 PROCshape(x%,y%,T%)
160 NEXT
170 END
180 :
190 DEF PROCshape(x%,y%,tone%)
200 R1=40
210 R2=128
220 FOR A1=0 TO 3*PI/2 STEP PI/2
230 A2=A1+PI/4
240 A3=A1+PI/2
250 MOVE x%+R1*COS(A1),y%+R1*SIN(A1)
260 DRAW x%+R2*COS(A2),y%+R2*SIN(A2)
270 DRAW x%+R2*COS(A3),y%+R2*SIN(A3)
280 DRAW x%+R2*COS(A2)/2,y%+R2*SIN(A2)/2
290 DRAW x%+R1*COS(A3),y%+R1*SIN(A3)
300 NEXT
310 CALL dotfill,x%,y%,tone%
320 VDU 5
330 T$=STR$(tone%)
340 MOVE x%+(LEN(T$)*charwidth/2),y%+8
350 PRINT STRING$(LEN(T$),CHR$(127));T$
360 VDU 4
370 ENDPROC
```

Listing 6

```
10 REM MiniPrint (Po86)
20 REM By Graham Parry
30 REM For Epson LX80
40 REM (c) BAU June 1991
50 :
60 VDU 2
70 VDU 1,27,1,51,1,16
80 VDU 1,27,1,77
90 VDU 1,15
100 VDU 1,27,1,83,1,48
110 FOR N%=0 TO 4
120 FOR C%=32 TO 126
130 VDU C%
140 NEXT
150 NEXT
160 VDU 3
```

Games

Listing 1

```
10 REM >JoyModSrc (Games1)
20 REM Fix for Man. Utd
30 REM for Arc only (Needs Man. Utd Game)
40 REM by T. Patterson
50 REM (c) BAU June 91
60 :
70 DIM code% &500
80 c$=CHR$13:t$=CHR$9
90 :
100 FOR pass%=4 TO 7 STEP 3
110 O%=code%
120 P%=0
130 [OPT pass%
140 EQUD 0
150 EQUD 0
160 EQUD 0
170 EQUD 0
180 EQUD title
190 EQUD help
200 EQUD commands
210 EQUD &CFFC0
220 EQUD swicode
230 EQUD swinames
240 EQUD 0
250 :
260 .title
270 EQUS "Joystick":EQUB 0
280 ALIGN
290 :
300 .commands
310 EQUS "Joy":EQUB 0
320 ALIGN
330 EQUD 0
340 EQUD 0
350 EQUD 0
360 EQUD helpcode
370 EQUD 0
380 :
390 .help
400 EQUS "Joystick module 1.00 (02 Feb 1991)":EQUB 0:ALIGN
410 :
420 .helpcode
430 EQUS "Joystick emulation module keys:"+c$+c$
440 EQUS "Stick"+t$+"Left"+t$+"Right"+t$
450 EQUS "Up"+t$+"Down"+t$+"Fire"+c$
460 EQUS "1"+t$+"Z"+t$+"X"+t$+"G"+t$+"V"+t$+"Space"+c$
470 EQUS "2"+t$+"Left C."+t$+"Down C."+t$+"Kpad 6"+t$
480 EQUS "Kpad 2"+t$+"Kpad 0"+c$
490 EQUB 0:ALIGN
500 :
510 .swinames
520 EQUS "Joy":EQUB 0
530 EQUS "Read0":EQUB 0
540 EQUS "Read1":EQUW0
550 ALIGN
560 :
570 .swicode
580 STMFD R13!,{R1-R11,R14}
590 MOV R4,#0
600 ANDS R11,R11,#1
610 MVNEQ R5,#98
620 MVNEQ R6,#83
630 MVNEQ R7,#99
640 MVNEQ R8,#97
650 MVNEQ R9,#66
660 MVNNE R5,#106
670 MVNNE R6,#26
680 MVNNE R7,#124
690 MVNNE R8,#25
700 MVNNE R9,#41
710 MOV R0,#129
720 AND R1,R5,#255
730 MOV R2,#255
740 SWI "OS_Byte"
750 CMP R1,#&FF
760 ORREQ R4,R4,#%10000
770 AND R1,R6,#255
780 MOV R2,#255
790 SWI "OS_Byte"
800 CMP R1,#&FF
810 ORREQ R4,R4,#%1000
820 AND R1,R7,#255
830 MOV R2,#255
840 SWI "OS_Byte"
850 CMP R1,#&FF
860 ORREQ R4,R4,#%100
870 AND R1,R8,#255
880 MOV R2,#255
890 SWI "OS_Byte"
900 CMP R1,#&FF
910 ORREQ R4,R4,#%10
920 AND R1,R9,#255
930 MOV R2,#255
940 SWI "OS_Byte"
950 CMP R1,#&FF
960 MOV R0,R4
970 ORREQ R0,R0,#%1
980 LDMFD R13!,{R1-R11,R15}
990 ]
1000 NEXT
1010 :
1020 PRINT"Insert disk to save module 'JoyMod' to in Drive 0 and hit SPACE":G=GET
1030 OSCLI "SAVE adfs::0.$.JoyMod "+STR$~code%+" "+STR$~O%
1040 OSCLI "SetType JoyMod Module"
1050 OSCLI "JoyMod"
1060 :
1070 CLS:OFF
1080 :
1090 REPEAT
1100 PROCresult(0)
1110 PROCresult(1)
1120 VDU30
1130 UNTIL0
1140 :
1150 DEF PROCresult(n%)
1160 SYS &CFFC0+n% TO A%
1170 PRINT';n%;" ";
1180 IF (A%AND 1)=1  PRINT"R"; ELSE VDU 32
1190 IF (A%AND 2)=2  PRINT"L"; ELSE VDU 32
1200 IF (A%AND 4)=4  PRINT"D"; ELSE VDU 32
1210 IF (A%AND 8)=8  PRINT"U"; ELSE VDU 32
1220 IF (A%AND16)=16 PRINT"F"; ELSE VDU 32
1230 ENDPROC
```

Figure 1 - Complete list of 6502 opcodes. 'Illegal' and otherwise undocumented and non-guaranteed codes are indicated with an asterisk (*). See Eight bits.

	Code	Instruction	Mode
	00	BRK	
	01	ORA	ind,X
*	02	HALT	
*	03	ASL-ORA	ind,X
*	04	NOP(2)	zp
	05	ORA	zp
	06	ASL	zp
*	07	ASL-ORA	zp
	08	PHP	
	09	ORA	imm
	0A	ASL	acc
*	0B	AND	imm
*	0C	NOP(3)	abs
	0D	ORA	abs
	0E	ASL	abs
*	0F	ASL-ORA	abs
	10	BPL	
	11	ORA	ind,Y
*	12	HALT	
*	13	ASL-ORA	ind,Y
*	14	NOP(2)	zp
	15	ORA	zp,X
	16	ASL	zp,X
*	17	ASL-ORA	zp,X
	18	CLC	
	19	ORA	abs,Y
*	1A	NOP	
*	1B	ASL-ORA	abs,Y
*	1C	NOP(3)	abs
	1D	ORA	abs,X
	1E	ASL	abs,X
*	1F	ASL-ORA	abs,X
	20	JSR	
	21	AND	ind,X
*	22	HALT	
*	23	ROL-AND	ind,X
	24	BIT	zp
	25	AND	zp
	26	ROL	zp
*	27	ROL-AND	zp
	28	PLP	
	29	AND	imm
	2A	ROL	acc
*	2B	AND	imm
	2C	BIT	abs
	2D	AND	abs
	2E	ROL	abs
*	2F	ROL-AND	abs
	30	BMI	
	31	AND	ind,Y
*	32	HALT	
*	33	ROL-AND	ind,Y
*	34	NOP(2)	zp
	35	AND	zp,X
	36	ROL	zp,X
*	37	ROL-AND	zp,X
*	38	SEC	
	39	AND	abs,Y
*	3A	NOP	
*	3B	ROL-ORA	abs,Y
*	3C	NOP(3)	abs
	3D	AND	abs,X
	3E	ROL	abs,X
*	3F	ROL-AND	abs,X

	Code	Instruction	Mode
	40	RTI	
	41	EOR	ind,X
*	42	HALT	
*	43	LSR-EOR	ind,X
*	44	NOP(2)	zp
	45	EOR	zp
	46	LSR	zp
*	47	LSR-EOR	zp
	48	PHA	
	49	EOR	imm
	4A	LSR	acc
*	4B	AND-LSR	imm
	4C	JMP	abs
	4D	EOR	abs
	4E	LSR	abs
*	4F	LSR-EOR	abs
	50	BVC	
	51	EOR	ind,Y
*	52	HALT	
*	53	LSR-EOR	ind,Y
*	54	NOP(2)	zp
	55	EOR	zp,X
	56	LSR	zp,X
*	57	LSR-EOR	zp,X
	58	CLI	
	59	EOR	abs,Y
*	5A	NOP	
*	5B	LSR-EOR	abs,Y
*	5C	NOP(3)	abs
	5D	EOR	abs,X
	5E	LSR	abs,X
*	5F	LSR-EOR	abs,X
	60	RTS	
	61	ADC	ind,X
*	62	HALT	
*	63	ROR-ADC	ind,X
*	64	?	
	65	ADC	zp
	66	ROR	zp
*	67	ROR-ADC	zp
	68	PLA	
	69	ADC	imm
	6A	ROR	acc
*	6B	?	
*	6C	JMP	ind
	6D	ADC	abs
	6E	ROR	abs
*	6F	ROR-ADC	abs
	70	BVS	
	71	ADC	ind,Y
*	72	HALT	
*	73	ROR-ADC	ind,Y
*	74	NOP(2)	zp
	75	ADC	zp,X
	76	ROR	zp,X
*	77	ROR-ADC	zp,X
	78	SEI	
	79	ADC	abs,Y
*	7A	NOP	
*	7B	ROR-ADC	abs,Y
*	7C	NOP(3)	abs
	7D	ADC	abs,X
	7E	ROR	abs,X
*	7F	ROR-ADC	abs,X

	Code	Instruction	Mode
*	80	NOP(2)	zp
	81	STA	ind,X
*	82	HALT	
*	83	?	
	84	STY	zp
	85	STA	zp
	86	STX	zp
*	87	STA-STX	zp
	88	DEY	
*	89	NOP(2)	zp
	8A	TXA	
*	8B	TXA-AND	imm
	8C	STY	abs
	8D	STA	abs
	8E	STX	abs
*	8F	STA-STX	abs
	90	BCC	
	91	STA	ind,Y
*	92	HALT	
*	93	?	
	94	STY	zp,X
	95	STA	zp,X
	96	STX	zp,Y
*	97	STA-STX	zp,Y
	98	TYA	
	99	STA	abs,Y
	9A	TXS	
*	9B	?	
*	9C	STZ	abs
	9D	STA	abs,X
*	9E	?	
*	9F	STA-STX	abs,X
	A0	LDY	imm
	A1	LDA	ind,X
	A2	LDX	imm
*	A3	LDX-LDA	ind,X
	A4	LDY	zp
	A5	LDA	zp
	A6	LDX	zp
*	A7	LDX-LDA	zp
*	A8	TAY	
	A9	LDA	imm
	AA	TAX	
	AB	?	
	AC	LDY	abs
	AD	LDA	abs
	AE	LDX	abs
*	AF	LDX-LDA	abs
	B0	BCS	
	B1	LDA	ind,Y
*	B2	HALT	
*	B3	LDX-LDA	ind,Y
	B4	LDY	zp,X
	B5	LDA	zp,X
	B6	LDX	zp,Y
*	B7	LDX-LDA	zp,Y
	B8	CLV	
	B9	LDA	abs,Y
	BA	TSX	
*	BB	?	
	BC	LDY	abs,X
	BD	LDA	abs,X
	BE	LDX	abs,Y
*	BF	LDX-LDA	abs,Y

	Code	Instruction	Mode
	C0	CPY	imm
	C1	CMP	ind,X
*	C2	HALT	
*	C3	DEC-CMP	ind,X
	C4	CPY	zp
	C5	CMP	zp
	C6	DEC	zp
*	C7	DEC-CMP	zp
	C8	INY	
	C9	CMP	imm
	CA	DEX	
*	CB	SBX	imm
	CC	CPY	abs
	CD	CMP	abs
	CE	DEC	abs
*	CF	DEC-CMP	abs
	D0	BNE	
	D1	CMP	ind,Y
*	D2	HALT	
*	D3	DEC-CMP	ind,Y
*	D4	?	
	D5	CMP	zp,X
	D6	DEC	zp,X
*	D7	DEC-CMP	zp,X
	D8	CLD	
	D9	CMP	abs,Y
*	DA	NOP	
*	DB	DEC-CMP	abs,Y
*	DC	NOP(3)	abs
	DD	CMP	abs,X
	DE	DEC	abs,X
*	DF	DEC-CMP	abs,X
	E0	CPX	imm
	E1	SBC	ind,X
*	E2	HALT	
*	E3	INC-SBC	ind,x
	E4	CPX	zp
	E5	SBC	zp
	E6	INC	zp
*	E7	INC-SBC	zp
	E8	INX	
	E9	SBC	imm
	EA	NOP	
*	EB	SBC	imm
	EC	CPX	abs
	ED	SBC	abs
	EE	INC	abs
*	EF	INC-SBC	abs
	F0	BEQ	
	F1	SBC	ind,Y
*	F2	HALT	
*	F3	INC-SBC	ind,Y
*	F4	NOP(2)	zp
	F5	SBC	zp,X
	F6	INC	zp,X
*	F7	INC-SBC	zp,X
*	F8	SED	
	F9	SBC	abs,Y
*	FA	NOP	
	FB	INC-SBC	abs,Y
*	FC	NOP(3)	abs
	FD	SBC	abs,X
	FE	INC	abs,X
*	FF	INC-SBC	abs,X

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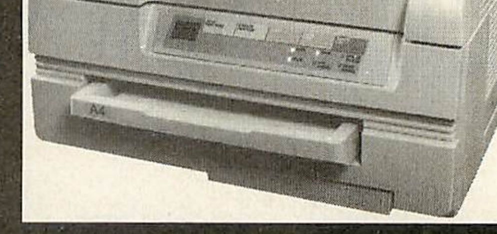
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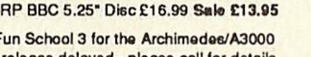
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- ACTIONS - Make teddy jump, hop, sleep, juggle, skip, eat & more
- PAINTING - Colouring fun down on the farm with all the pigs & cows
- GALLERY - Learning to read is really easy in the Fun School Gallery.

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- TIME - Tell the time & watch the cuckoo clock come alive
- FUNTEXT - Explore the Ceefax-style database & take the challenge
- COLLECT - Guide the frog from log to log to create & solve the sums
- ELECTRICITY - Fix the incorrect circuits to set the bell ringing
- JOURNEY - Travel round the village & learn about directions.

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- WORD SEARCH - Pick out the words cleverly hidden in the large grid
- ROBOT DRAW - Create beautiful patterns & learn how to program
- PLANETARY MATHS - Solve the sums before they hit the forcefield
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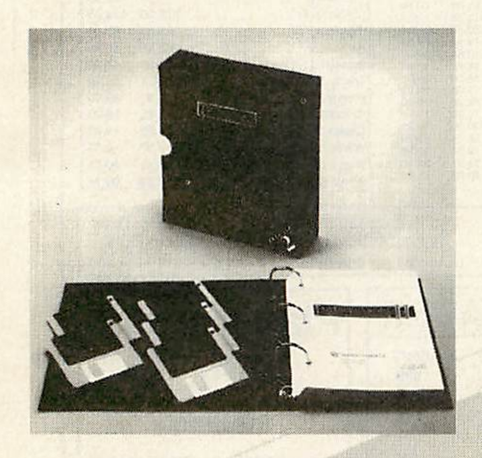


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Impression is not

Well OK, that's not true. Although Impression has established itself as the most popular DTP program (and the most flexible) for the Archimedes, it may be surprising to learn that most owners use it day in, day out as their preferred word processor.

Impression was in fact designed from the start to be a word processor, by the company that developed Wordwise and Inter-Word, the most popular word processors on the BBC Micro. However Impression now uses the power and flexibility of the Archimedes to take word processing beyond what was possible on the original BBC Micro while losing nothing of the ease and simplicity of its predecessors.



" Easier to use than Wordwise ". Well certainly no more difficult. For example to create and print a simple letter, even one many pages long, involves the following simple steps, (assuming a printer is set up and ready).

- Start Impression
- Click on icon for new document
- Click in window and type letter
- Press PRINT key followed by RETURN

There are no embedded commands to remember and it's not even necessary to use any menu options. If you want to use different text styles or justification options, these can be selected from the function keys (or menus). Selecting regions of text (for deleting, copying, moving etc) could not be easier than with the mouse, especially since we added such touches as automatic scrolling of the window when attempting to select beyond the visible window.

So not only do we feel Impression is easier to use than other word processors, it is also more powerful - not only can it handle more complex documents, it copes with much longer documents and provides unmatched control of the presentation and appearance of the finished document. By using the Acorn outline font system Impression offers complete control of type style and size - the type on screen exactly matches the final printed result.

One feature that sets Impression apart from other DTP programs is that it offers both the outline fonts system *and* a system-like font for simple 'character' mode or draft mode operation. This also means it can drive dot-matrix printers using their native built-in fonts for maximum speed. Of course using the RISC OS printer drivers in high quality mode means that whatever you do on screen, whatever fonts, size, position, style, graphics are used, they will be reproduced at the maximum resolution of the printer.

For the power user (that is someone who produces documents of any type on a regular or professional basis) Impression II provides the necessary features (frames, styles, master pages, embedded graphics, unlimited length documents, contents and index generation etc).

$$J_n(x) = \frac{x^n}{2^n n!} \sum_{s=0} \frac{1}{s!(n+1)^s} \left(-\frac{1}{4}x^2\right)^s$$

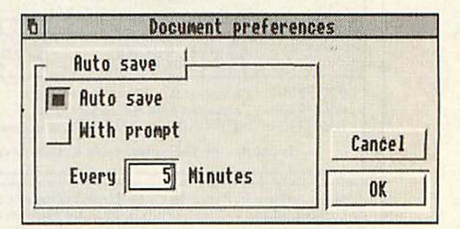
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When used with our highly acclaimed Equasor equation generator program (£49+VAT) Impression is the ideal tool for producing technical or mathematical documents.

> In order to highlight particular sections of text Impression 2.1 allows sidebars, such as the one used here, to be set as part of the style. The vertical position, thickness and colour can all be controlled from the style editor.

But rather than the more obvious and powerful features, it's the subtle and often overlooked aspects of Impression that make it a delight to use - its speed of operation; the fact that most dialogues can stay on screen while you continue to edit; the care and attention paid to the visual side of the program. Even though the program is now more than a year old it continues to receive glowing reviews.



Impression 2.1 can automatically save your document every 'n' minutes, with options to do this with or without prompting.

a DTP program !

To quote Paul Beverley, editor of Archive magazine. *"Thanks to Impression (which I am more and more impressed with every day) I have managed to shorten the time taken to produce the magazine quite considerably."*

Although Impression is a word processor, what other word processor, or for that matter DTP program, is able to produce results like this advert.

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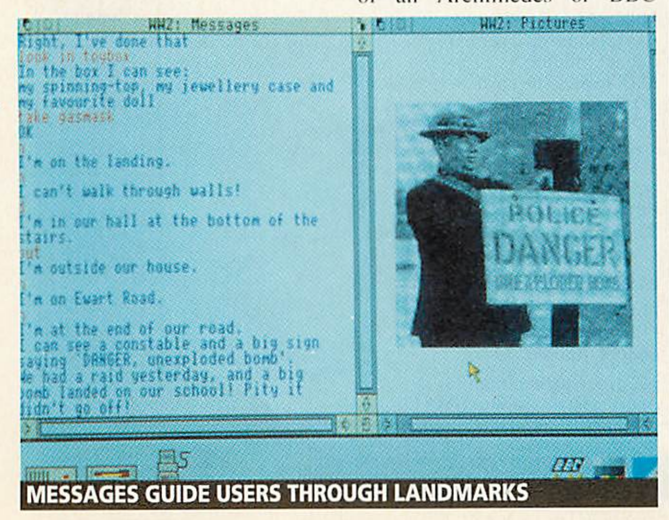
TIME MACHINE

DAVE FUTCHER roots around in the past with the latest in history simulation programs from Longman Logotron

Imagine a desk calendar on which the date could be moved backwards so that the past becomes the present. Then imagine a door opening so that the past can be experienced – an artificial reality to give history a new meaning.

Well, that is the concept behind Longman Logotron's new series of programs called *Landmarks*, linked to the BBC television series of the same name. The first two programs, *The Second World War* and *Project Egypt*, have just been published.

The series uses some of the techniques of adventure games and computerised Dungeons and Dragons, plus some sophisticated artificial intelligence. A world appears on the screen of an Archimedes or BBC A3000 and interaction with the people in that world is possible through the keyboard.



MESSAGES GUIDE USERS THROUGH LANDMARKS

With the program loaded the computer can be seen as a sort of 'keyboard-telepathic' link between children in the classroom and the world created in the 'landmark'.

But don't confuse *Landmarks* with an adventure game – there is no plot, no one to rescue and no treasure. It is a computer-created world that is there for users to explore and learn about as they please. Adventure games are interactive fiction – *Landmarks* could be called interactive reference.

BACK TO 1940

The first *Landmarks* world is called *The Second World War*. Set in September 1940, in a small seaside town called Westbury-on-Sea in Somerset, it features Jean, aged 10.

The war is portrayed as an austere and uncomfortable time. The program starts off in Jean's house, where you are given descriptions of the bedroom that she shares with brother Brian and the cosy front room that Jean assures the user is 'lovely in winter when we sit round the fire, listening to the wireless and eating hot chestnuts that we've cooked in the embers'. Despite this, the blackout curtains and gas masks are not far away.

Exploring Westbury builds up the 1940s world further. At first you seem to be intentionally remote from the shock of Dunkirk and the start of the Battle of Britain. There are lots of places to see and people to meet in the town and you tend to discover more as you travel along through the town.

Walking along the High Street you are stopped by some soldiers who ask for your identity card. When you look around the grocer's shop you are told that foreign fruit is scarce and a digitised screen of food hanging in the window is shown. To assist with the text description, the picture screen brings up some advertising posters of the time, including the Bisto gravy and Bird's egg powder ads.

Without too much trouble the simulation lets the user build up a minutiae of everyday 1940s life. It's certainly not blitz-torn London, but there are elements of high drama. Jean can't take you to look at her school because of an unexploded bomb, which a bomb disposal team is trying to defuse. The air raid warden blocks the road and sends you away but, by climbing over the wall behind the station, you can get on to the school lane and then go and see the bomb. Of course, some soldiers catch you and send you safely away.

The simulation is 'active' for three whole days starting from the first session and the program is synchronised in real time. If you say goodbye to Jean and then run the program a few hours later, an identical amount of time will appear to have passed in the simulated world – events appear to have taken place while the computer is off.

The peace is shattered by the morning of day two when the town suffers an air raid and the reality of war is experi-

enced first hand. There is the wail of the air raid siren, Spitfires taking off from the local airfield then the throb of the German planes and the fire from the anti-aircraft guns.

VALLEY OF KINGS

The second *Landmarks* package is set in ancient Egypt in a small village in the desert hills above Thebes, approximately 3000 years ago. It covers three days in the life of Kenhirkhopeshef, (or Shef for short), an 11-year-old boy who lives in the village with his family. The simulation is actually set in the 15th year of the reign of Ramesses II, a Pharaoh of the 19th Dynasty who ruled around the year 1250 BC.

Many of the characters and places seen in the village, which is today called Deir el Medineh, are real and quite thoroughly documented by archaeologists. Shef's father, Ramose, is a well known and documented scribe.

In *Project Egypt* you can use the computer to ask Shef questions, just as you might ask one of your own friends, to find out more about his life and what is happening in the world around him.

By getting Shef to take you around his home you can build up a picture of what his life was like. You will find his pet monkey and ball and discover that the front room is where Shef's mother and father receive guests and that 'there is often much singing and dancing'.

At first you explore the mud brick houses in the village and find them all much like Shef's home and then you go further afield. Among the interesting places is the Tent of the Dead, where you find Akhtay's body, which has been covered with natron – a yellow dust from the river valley in Lower Keme. As it dries everything it touches, the priests use it for preserving the body.

As Shef shows you round the tent, you are told that several priests are working, preparing and winding bandages around Akhtay's body.

You are taken to the Temple of Amenhotep, and the Tomb of Ramose and eventually you go to The Great Place (the Valley of Kings), and actually go into the tomb of Rameses, which is currently under construction. If you find a light (well hidden in the warehouses) Shef will describe it for you. This personal description on screen will make any pictures children later see seem more relevant.


PROJECT EGYPT IS SET IN THE LAND OF KINGS

Project Egypt opens a new view on life in ancient Egypt. The program cleverly and carefully prompts the user so that they are encouraged to discover as much as possible about Shef's life – the things he sees, owns and uses, and the people he meets.

CONCLUSIONS

Landmarks should not be used in isolation. Experiences gained using the program should provide the context and stimulus for other learning activities to be developed. Either package will make a good centrepiece for thematic work. Getting the best from the programs will depend on the level of support work done away from the computer. Each program comes with a very good pupil's book, which contains a set of workcards and extension activities and there is also a teacher's book.

Landmarks – Second World War and *Landmarks – Project Egypt* are really sophisticated simulations. But they are not difficult to use and there are no special commands – three function keys help with input like 'What can you see?', 'Where are you?' and 'Describe...' But that is not the limit of what the child can enter. The vocabulary range is impressive – over 800 words can be understood and they can all be used naturally. Each program has more than 60 different locations to visit and over 70 different people and objects to interact with.

Children can learn more effectively when they have the opportunity to make sense of the experiences they are having on their own terms and when they are relaxed enough to do so. *Landmarks* seems to offer these possibilities in abundance.

Both programs are outstanding computer-based simulations that have tremendous potential for individuals and groups of children to focus on a shared experience, without intervention and control from the teacher.


WAR BOMBING DAMAGE


VALLEY OF THE PHARAOHS

PRODUCT DETAILS

Landmarks – The Second World War and Landmarks – Project Egypt are available for the BBC A3000 and Archimedes computers and cost £19 each. For further information contact Longman Logotron, Dales Brewery, Gwydir Street, Cambridge, CB1 2LJ.

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MONITORING THE ARC

TOM CARRION tries a new Arm code disassembler for the Arc

If you have been looking for the first widely available Arm code disassembler for the Archimedes, then *ArcMonitor* has just been launched.

Prior to its release, Arc hackers had to rely on the built-in OS commands *MemoryI, *ShowRegs, *BreakSet, etc. Unfortunately, just because *ArcMonitor* is the first disassembler to be released doesn't automatically make it the best.

What you get for your £25 is a 30K relocatable module, a couple of example programs and a minimal Risc OS application to install *ArcMonitor* on your icon bar.

This is a waste of time as *ArcMonitor* doesn't multi-task on the desktop, and you can't disassemble machine code applications, as Memc sensibly hardware-protects the memory.

To get into the monitor, you either click on its icon, type *AM from the command line or possibly most usefully with the SWI call "AM_Enter". This sets up *ArcMonitor,* automatically pointing to the instruction after the "AM_Enter", ready for you to see why your code is going wrong.

Once in the monitor, you come across its main downfall – it is all mouse driven and there are no keyboard shortcuts, not even for scrolling up and down the disassembly listing. There are some nice features gained by using the mouse, most notably that you can 'drag' register values around the screen and drop them onto other registers to copy them, or onto the disassembly listing to view that memory address. But even this system has not been fully implemented as you cannot drag values off the stack or from the 'word' format memory dump.

The main area of the screen is taken up with the disassembly, which can be swapped between Arm instructions and a memory dump in bytes, words or characters. A register list is displayed in the top right, along with a section of the stack (that always assumes you're using an 'FD' stack!) and the various processor flags. These can be toggled by clicking on them with the mouse. Below this is the icon area with some really tacky icons for scrolling the listing up and down, setting breakpoints, entering *commands and quitting. Below this is a help window, and a 'VDU output' area – all OS write character routines are redirected to this area. This does stop the screen getting over written, but the window is too small to be of serious use.

The only features available are program tracing (either until a breakpoint is reached, or single stepping one instruction at a time) and what is called 'memory protection'. This allows you to copy an area of memory to somewhere safe and redirect all accesses to the original area to the new area. This can prevent the machine hanging if you happen to be using some dodgy memory locations (such as OS workspace).

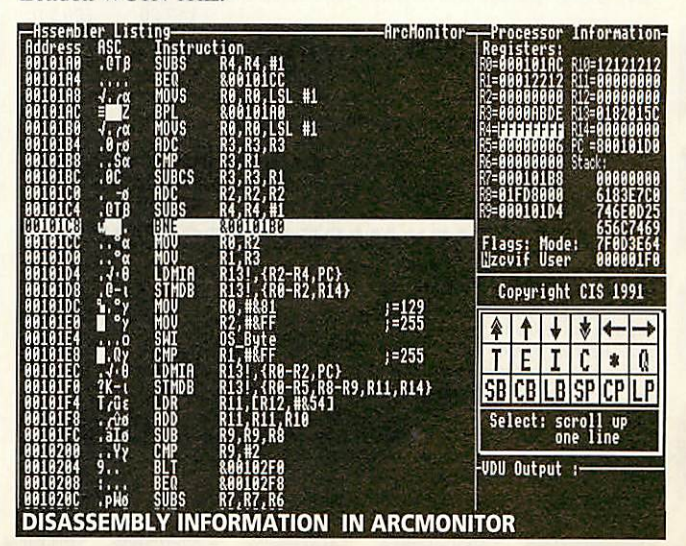
Sadly, the few good points in *ArcMonitor* are heavily outweighed by the bad points and a lack of features that you really need. There is no built-in assembler, no memory move commands, co-processor instructions are not disassembled and no facility for hard copy, to name a few. Occasionally a special narrow font is used if a long instruction (eg, a STMFD) is being disassembled – this can give the listing a very peculiar appearance which could have been improved by simply using this font throughout.

The pseudo instruction ADR (which assembles to an ADD or SUB with the PC) is spotted, and a comment is added to the line showing the actual address, but it is not disassembled as an ADR. The program takes over the whole machine which can be a real pain, especially then having to find your mouse to control it – an equivalent to *MemoryI should also be available.

I would like to see a disassembler that could work out the difference between machine code and data areas, insert labels and allow register numbers to be anti-aliased to help legibility. It should also allow multiple views of memory, allowing you to recurse down subroutines without losing track of the parent routine and to view an area of workspace at the same time as a program listing. If it could also swap between its screen and the program's screen by some cunning hot-key system, then so much the better.

I used *Exmon* on my BBC for years, and it had many more features than *ArcMonitor*. I think I'll be using *MemoryI for the time being. I'm afraid *ArcMonitor* does not even come close.

ArcMonitor costs £24.95 from Cambridge International Software, 8 Herbrand Street, London WC1N 1HZ.



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UPDATE

SIMON BURROWS looks at how Arc users can benefit from the wide range of available public domain software

One of the growth areas in the Archimedes market is Public Domain software and Shareware – but what do these terms mean, and what sort of software is available?

Public Domain (PD) software can be copied and given to other people without the need to pay the author a fee. In return, users are expected to comply with the conditions laid down by the author – these normally state that you may not charge for the software, and that it can only be supplied to other users if complete and unaltered.

Shareware is distributed in a similar manner, but you are expected to pay a fee to the author if you find the software useful, in return for which you will usually receive upgrades, printed manuals and proper support – a sort of 'try-before-you-buy system'. To add confusion, Norwich Computer Services produces some excellent discs known as Shareware/Careware discs, which contain PD software and/or Shareware. For each Careware disc sold, a donation is given to charity.

Since the authors do not receive financial rewards, you might well question the quality of PD software – after all, there are not many people around who would be prepared to spend hours writing a program and then allow just anyone to have a copy.

So why do it? Well, prestige is often the answer – many PD authors become well known and respected for their programming ability, and Archimedes PD is usually of a very high quality, with lots of it available at minimal cost.

So, where can PD software be obtained? Well, there are a number of 'libraries' operating and these will supply you with discs of PD software for charges ranging from about £1.20 to £3.60 per disc.

These charges cover the cost of the disc, p&p and advertising. Several of these PD libraries can be found in *BAU*'s Software Showcase (see page 124).

PD software can also be downloaded from a number of bulletin boards with Archimedes sections, as well as from some viewdata systems, such as Micronet and Acorn's SID (Support Information Database).

Many Archimedes user groups have their own PD libraries, which are generally free or very cheap for members to borrow from. But the cheapest method of all is to contact other users, and swap PD software with them.

CATEGORIES

There are many different categories of PD software available, but I have concentrated here on some 'useful' items – many PD games are also available, and there are numerous graphics and sound demonstrations which show off the power of the Arm processor (and the programmers' skill!).

Some PD software offers similar facilities to software sold at full price, so providing the PD software does what you want, you can save yourself a lot of money.

Some of you might be familiar with David Pilling's excellent *Spark* program (not PD) which can be used to compress files into one single file (archive), so they take up less disc space.

A Shareware application has been written by Mark Smith called *ArcFS*, which makes *Spark* much more useful, and renders *SparkPlug* (the PD read-only version of *Spark*) obsolete. Once *ArcFS* is loaded, clicking on a *Spark* archive opens a standard directory window for the archive, and files can be loaded and run directly from within it.

So, by putting files into archives, you can fit far more onto your floppy/hard discs, and loading directly from an archive takes only a little longer than normal loading. It can cope with all archive types, including 16-bit compressed ones, and it installs itself on the icon bar.

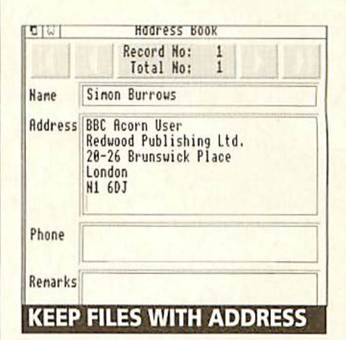
For those who have become hooked on writing Wimp programs, the *Interface Manager* module written by Simon Huntingdon is a real must. This provides many extra SWI calls and validation strings which enable you to produce attractive windows.

Sadly the method distributing PD software has resulted in one or two Archimedes 'viruses' being propagated. PD authors have come to our aid with several virus killing/innoculating programs, such as *VKiller*, written by Richard Lloyd, which deals effectively with the Extend virus.

Richard has also written *Trash*, which displays a dustbin on the icon bar, and any files which are dragged onto this icon are deleted – with some interesting side-effects!

Several different backdrop programs have been written, such as *StickyBD* and *PlaceIt* by Ian Ashley. These enable you to drag files onto the desktop background where they appear to stick – they can then be loaded by double-clicking on the icons without having to open the correct directory windows. This can be a very useful feature, especially on hard discs.

A number of utilities exist for use with outline fonts. *MakBitMap* by Mark Bright and *FontCtrl* by Acorn both make bitmap files for outline fonts. These enable the caching of fonts to be speeded up, so reducing appearances of the hourglass if your Arc doesn't have an Arm 3 fitted.



KEEP FILES WITH ADDRESS

Several Wimp front ends for Acorn's Basic Editor module exist, and if you drag a Basic program onto their icons, the editor is started up with that program ready to be edited. Ben Summers' *FileUtils* suite provides a miscellany of useful utilities for file handling, and interestingly it is written in C.

PrBuffer by Anton Carver sets up a printer buffer in Ram so that you don't have to wait so long for your printer to finish printing, and *Address* by Alex Hopkins (recently enhanced) provides a comprehensive replacement for your FiloFax or address book.

FONT CONTROL IS AVAILABLE AS PUBLIC DOMAIN

PD ACTION

Over the coming months we intend to take a look at more items of PD software. So, if you have any questions on PD, or would like to recommend some useful PD software, why not drop us a line? Write to: BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ.

POINTS OF VIEW

Children can wander through an imaginary environment without straying from their A3000 or Arc, courtesy of Viewpoints. **CHRIS DRAGE** looks at it

Educational software publishers, Sherston Software, launched a new package at this year's BETT Show. *Viewpoints* represents Sherston's third successful excursion into the realms of Archimedes software and comprises three discs, a 64-page handbook, two A3 maps, an A4 map, 48 animal identification or information cards and a set of ideas cards.

It is designed to offer nine-15-year-olds many possibilities for exploration and follow up work. Essentially, *Viewpoints* provides an interactive 'environment' based on a rural area, comprising a village, surrounding countryside and seaside. Following set paths, children can wander around this environment just as they would in the real world.

Using the map provided they can explore all the aforementioned areas, including under the water!

Along the way they can stop at any of the numerous locations to see if there is anything of interest. At a number of special locations investigation in depth is possible, allowing users to take a closer look at specific parts of the scene, taking 'photos' with their own 'camera' of any interesting wildlife.

The package includes Start-up, Exploration and Database discs, all of which may be installed on a hard disc (if you have one), which certainly helps to speed up all operations. The software runs on any Archimedes fitted with 1Mb of memory and, whether you run *Viewpoints* from a hard disc or not, you need to have the start-up disc inserted in the floppy drive in order to run the program.

Viewpoints is not Risc OS compliant, so it takes over the whole screen and is unable to multi-task. However, on completion it will return you to the desktop and to any applications that were running, and it does use the mouse in the accepted Risc OS fashion.

There is a fairly lengthy title sequence (which can be bypassed) that sets the scene rather well. In true Sherston fashion, this leads to a menu screen offering a choice between starting *Viewpoints*, or the Teacher Control Screen. The latter option permits control over which of the introduction, mapping, exploration and database sections are to function, the current database/sprite directories and the printer type. The system defaults to all the options being ON.

The introductory section sets a simple scenario where a mining company has been blasting in the area to ascertain whether or not there is a gas field nearby. The blasting has frightened the animals, some of whom have moved from their natural habitats to other locations. The children's task is to prove to the mining company that animals have been dislocated, whereupon they will 'relocate' them to their correct habitats. This introduction is only a suggestion and it is up to the teacher to create alternative scenarios.

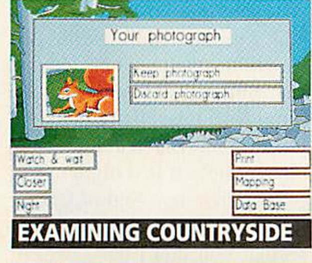
With the exploration and database section switched off, the mapping section can be used alone as a treasure trail adventure, where the number of clues left at different locations can be changed to affect the length of the game. This is actually a good way for children to become familiar with the environment.

One of the first surprises they find is that movements in the program are far simpler than their map suggests. Where a path on the map looks long and tortuous, the program sometimes takes long 'jumps' between locations.

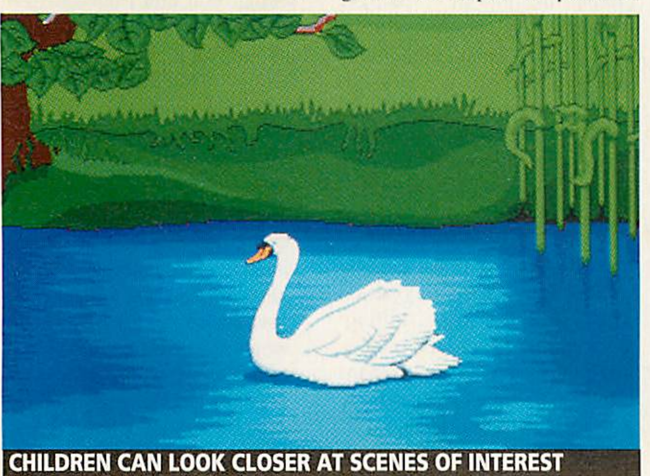
Incidentally, the map supplied with the program is too small and some children might find it confusing. The two large colourful maps provided are much better. After following the clues and correctly reading the map, the final location is found and a golden statue is offered as a 'reward'.

The exploration section may be used at two levels: if the mapping section is turned off, the eight detailed locations are found via a simple menu.

This helps both teachers and pupils to become quickly familiar with each of the habitats without having to search for them first. With the mapping section ON, searching and locating the various habitats takes some time – but the children are using all the map



EXAMINING COUNTRYSIDE


CHILDREN CAN LOOK CLOSER AT SCENES OF INTEREST

and screen clues in order to solve the problem.

The exploration section functions, regardless of whether the database section is selected or not. Once the children are in the vicinity of a habitat, an Investigate button appears which provides access to a detailed view. The eight habitats include: an oak wood, a sea cliff, a river, mountains, a pond, rock pools, a garden and a meadow.

At a habitat you can 'watch and wait' until a creature makes its presence felt. You can 'photograph' it by placing a frame over the moving animal and clicking Select. The resulting sprites are kept in memory for viewing and can be saved for use in the database section, or in other Risc OS applications. The habitat can also be viewed at night and specific areas of the habitat can be 'zoomed' in on for closer investigation and photography. The handbook lists all the creatures associated with each habitat so teachers can check how thoroughly the children are exploring.

Being fully aware of the demands in the National Curriculum for information retrieval and analysis, Sherston has included a simple card index type database manager. The database section may be used quite independently, or it may be used in conjunction with the exploration section where it can be accessed via an on-screen button. In this mode, it serves children with an almost instant source of information about the wildlife in the program.

However, before any such information can be acquired, a database must be created – this is a particularly nice touch as it encourages children to create their own datafiles, an important element in the NC. Information is provided about all the creatures on the cards supplied with *Viewpoints* which can form the basis of the children's own database. The disc even holds a sample file to get them started.

All the usual features are present: create database, use database, searching, sorting, adding and deleting fields, etc, and all laid out in a very attractive manner. The ability to include a picture field means that each of the children's 'photographs' can be included as well. Although teachers are able to set up separate database and sprite directories on one disc, in my experience it is better that groups actually have their own data discs.

The database section is not limited to *Viewpoints* data alone, but can be used in its own right providing the other options are switched off. Creating fields and suitable card layout is quite easy, but you must decide whether you want children to learn how to manipulate data via this system, or in a Risc OS compliant system, such as *Datasweet*, *DataKing Plus* or *Junior Database* (see review on page 109). Data from the database can be graphed (bar charts only), or up to 40 items of data can be entered on a chart and be represented graphically. It is all very simple to use.

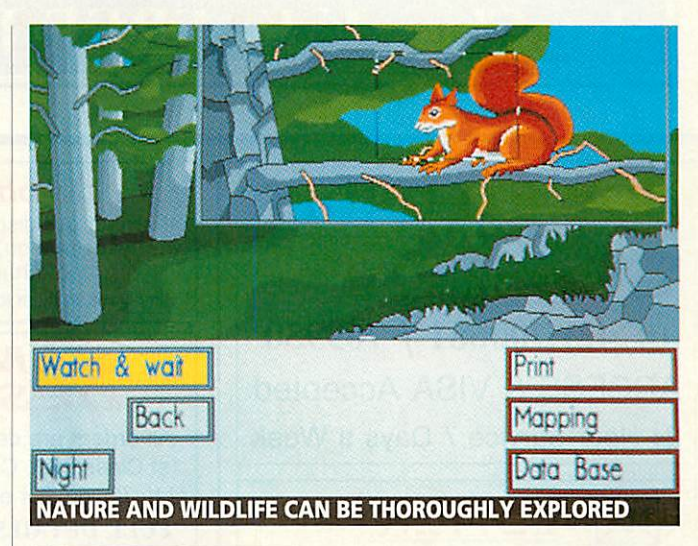
Everything can be printed, with printer drivers provided for both Epson compatibles and the Integrex Colourjet. These are quite nippy, but it is a shame that Risc OS printer drivers cannot be used.

My only gripe with *Viewpoints* is to do with the way the ESCAPE key is implemented. Pressing ESCAPE at any point drops you out of the program completely, returning you to the desktop with no way of returning to where you were, other than starting all over again. Sherston informs me that this point will be addressed in future releases.

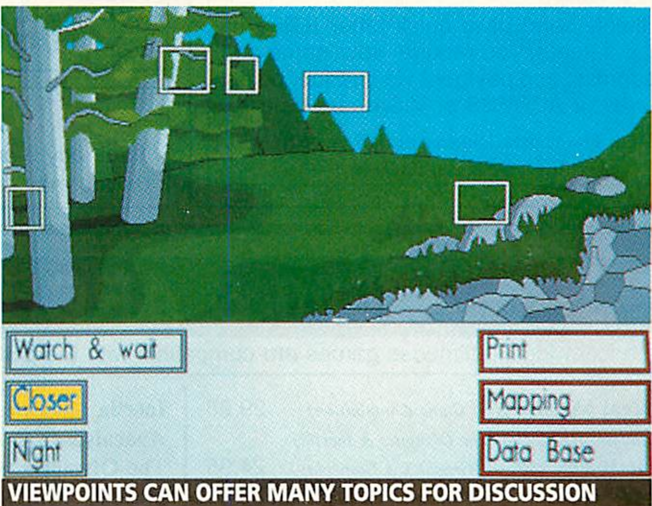
Viewpoints can be used in many different ways according to the needs and abilities of the children and within the framework of the National Curriculum. The ideas cards offer several discussion or debating points which can be developed in a number of ways. Can children find a reason why the local council shouldn't allow a factory to be built near the village? Where would the best route for the supply road be? Should the village then be allowed to spread with new housing estates? Other discussion points centre around the desire of the local camp site owner who wants to develop a new site in the area.

Similar discussion points could take the form of the development of a dry ski slope or plans to open a quarry or rubbish dump. The *Viewpoints* scenario provides countless such opportunities for conservation issues to be developed. Similarly, it can be used in a variety of different ways: it could provide a starting point for various types of writing, eg, reporting, letter writing, descriptive, imaginative, and so on. It could form the basis for debate at the secondary level, for discussion groups at the primary level and for drama work at any level.

The mapping section could be used as part of a map reading exercise. Similarly, the database could be used in its own right for information retrieval and analysis that children need to do in any area of the curriculum. All this illustrates *Viewpoints'* major attribute: far from being prescriptive, it allows teachers to gauge what they wish to take from it and in the manner most suitable to the needs of their pupils.



NATURE AND WILDLIFE CAN BE THOROUGHLY EXPLORED



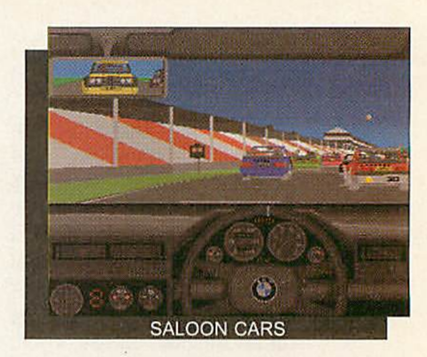
VIEWPOINTS CAN OFFER MANY TOPICS FOR DISCUSSION

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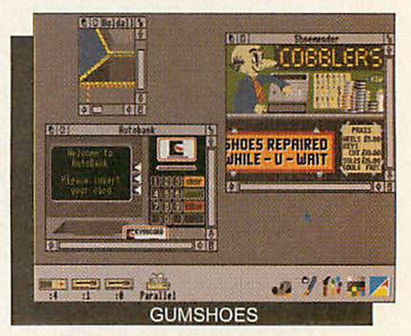
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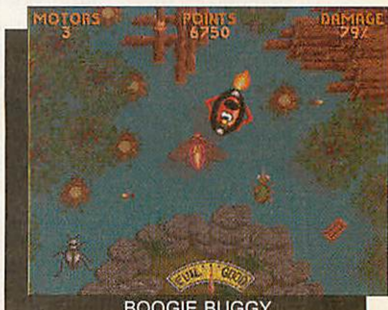
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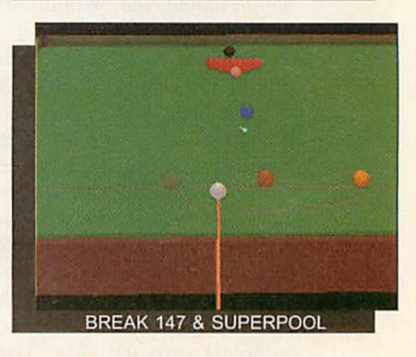
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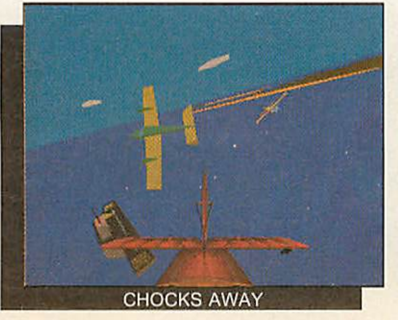


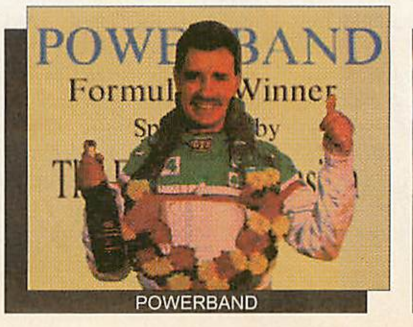
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PINEAPPLE SOFTWARE

The Pineapple Software Real Time Colour Video Digitiser

The Pineapple Software Real Time Colour Video Digitiser is now supplied with not just one, but two fully multitasking application programs! In fact the software supplied with each Digitiser comprises at least four different programs, (the number is increasing all the time). Included in these is the !Micci application which is probably the most user friendly of all video processing programs. (See photo).

HARDWARE

The Digitiser hardware consists of a double width podule which plugs straight into the back of a 300 or 400 series Archimedes. (Note that a podule backplane is required in 300 series computers).

For A3000 owners we supply a special inexpensive adapter box which contains the digitiser card and plugs into the back of the A3000 using a ribbon cable.

Inputs are provided for PAL composite video and also R,G,B. Manual adjustment of Contrast, Saturation and Brightness provide for ease of initial setting up.

SOFTWARE

The Heart of the Digitiser software is a relocatable module which contains all the video processing routines. All of the previously mentioned software applications access these routines in various ways. For the user who can write simple BASIC programs this module provides easy access to all of the Digitiser routines via '*' commands and SWI's

The new multitasking software makes life very easy for those who wish to incorporate images into Wordprocessing, Desktop publishing, or Art packages. The ease with which grabbed images can be 'zoomed in' and 'cropped' to the required size has to be seen to be believed, and when the required part of the image is selected, it is then a simple matter to 'drag' the image directly into another application.

As well as providing it's own powerful processing routines the Pineapple Digitiser can just as easily use software such as ChangeFSI or AIM to process it's images giving unrivaled versatility.

Also now available in the Multitasking software is a routine to allow capture of a sequence of frames. The number which can be stored depends on the amount of memory you have available (and the size of image chosen), and when grabbed the images can be stored to disc or transferred to PAINT for analysis.

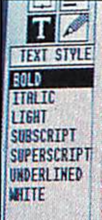
EXCLUSIVE FEATURES

The Pineapple Software Real Time Colour Digitiser is the only one currently ilable with the following exclusive features:-

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2. Two independent multitasking applications plus other powerful software.
3. Digitising of the full video area normally displayed on a TV screen.
4. R,G,B inputs providing higher quality pictures from professional video equipment.

SPECIFICATION

Video Inputs	Pal coded video. 75 volts – 2.5 volts pk to pk. R,G,B, & sync input All inputs may be terminated by internal DIP switches.
Resolution	512 x 256 pixels
Storage system	Standard version 4 bits Red, 4 bits Green, 4 bits Blue – 192k Ram Extended version 5 bits Red, 6 bits Green, 5 bits Blue – 256k Ram
Picture Area	The Digitiser hardware allows the full screen area normally viewed to be stored in the podule ram. Horizontal shift, Vertical shift and width can be adjusted internally if required.
PAL Decoder	The PAL decoder provides manual control of Brightness, Contrast and Saturation, combined with full auto saturation control.

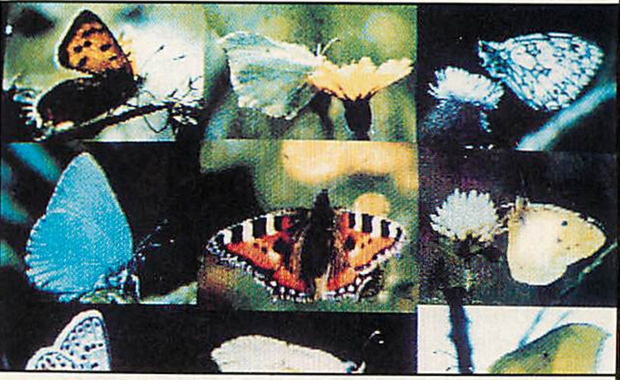




!Digi Multitasking Application



!MICCI Application



Butterfly collection

PAL COLOUR CODER

A new hardware product now available from Pineapple is a high quality colour coder video unit. This unit produces a full colour coded video signal from the Archimedes computer which enables you to feed the output of the computer into a video recorder or second colour TV monitor.

FEATURES:-

1. External to computer – no podule slots required.
2. Complete sync pulse regeneration to provide the best possible signal for recording onto VHS recorders or displaying on TV monitors.
3. Switch selectable to 624 or 625 line operation – for interlaced or non-interlaced screen modes.
4. Plugs into R,G,B, computer socket and provides buffered output to feed Archimedes monitor, + coded signal output.
5. Adaptable for use with other computers or R,G,B, and Sync signal sources.

S/CHS Version £79.00

Price £69.00 + VAT p&p free

– 'Pineapple has produced one of the 'ultimate' Computer Video Digitisers' –

– 'The Pineapple Colour Digitiser looks to be one of the most professional products yet to be seen on the Archimedes' –

Acorn User – April 90

Digitiser Prices

Standard	**£285.00**
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The full auto-route facilities are available even on a standard unexpanded model 'B'.

'PCB Autoroute is remarkable. No similar software comes near the price. *Acorn User* – Aug 88

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RB2/115	Archimdes £45.00	Postage & Packing on Tracker Balls £ 1.75
RB2/110	Nimbus...............£45.00	



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CLASS OF ITS OWN?

Iota's new database package is aimed at primary school level. **CHRIS DRAGE** explores its possible applications

Whether your school is involved with the National Curriculum or not, datahandling using computers is a vital IT application.

One of the principle reasons for computers being so well established in our society is that we are all involved with information of one type or another and machines can handle information very quickly and efficiently. So storing, interrogating and interpreting information with computers is an important activity for children. Indeed, the National Curriculum orders for science, mathematics and technology reflect this.

Pupils who learn to create databases of information as a natural part of their project work can gradually develop an understanding of how to handle information generally.

In addition, the collection, organisation and presentation of data helps them to see the value of information as a resource.

The Archimedes and BBC A3000 computers offer the speed and memory which are so important for fast searching, sorting and attractive graphical presentation of data. Certainly, users are becoming spoilt for choice with database management software like *Key Plus, Flexifile, Multistore* and more recently, *Squirrel* (reviewed in last month's issue), each offering a range of features suited to particular environments.

However, at primary school level, the situation is a bit more limited, with *Datasweet* (reviewed *BAU* March 91) representing the 'beginners end' of the spectrum and *Dataking Plus Junior* (Shenley Software) bridging the gap between this and *Key Plus*.

However, *Junior Database* from Iota Software looks certain to add a totally new dimension to what might be termed 'user friendliness'.

Junior Database comprises a disc and a handbook – a simplicity which admirably reflects Iota's philosophy of making the software deliberately concise, and very simple and consistent to use.

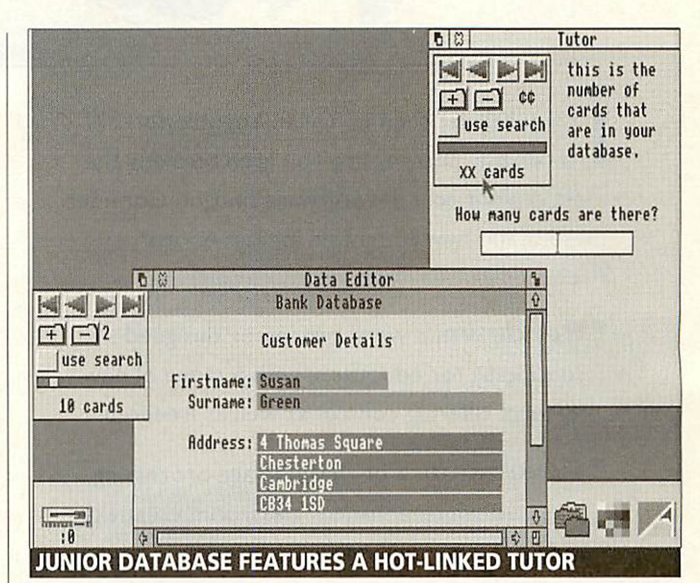
This point is underlined by the fact that the system comes with a 'hot-linked tutor', which explains on screen what you are doing as you go along, virtually negating the need for the manual.

INSTALLATION

Clicking on the TJD and tutor icons installs each respectively on the icon bar. To create a datafile you click on the TJD icon which enters the layout editor and brings up a blank window representing a card on the screen. What becomes immediately apparent is that this is very much an electronic card index system – once the card is dragged to a suitable size, a pop-up menu provides options to add a title, text and fields to the card and edit these in a number of ways.

Creating fields really is as simple as entering a field name and clicking. The resulting 'field box' – including field name, field number and data area – can be dragged and placed anywhere on the card. This makes the process of creating and positioning fields very fast indeed.

Once a number of fields is in place you can alter their position, type (text, numbers or date), the position of the data on each line (left, right or centre), the field length, title and background colour. Groups of fields can be copied or deleted. One notable feature is the software's ability to select a group of fields – for example, address fields – and to dispense with the field names of those below the first field of the group.

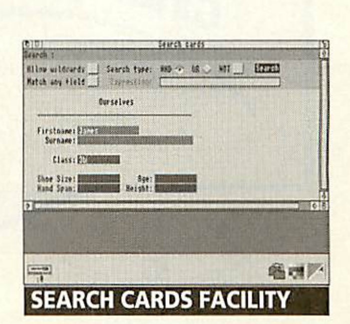


JUNIOR DATABASE FEATURES A HOT-LINKED TUTOR

As every dataline within each field has a number, the software knows the field information. The visual effect is a considerable improvement on the more usual Address1, Address2, Address3, etc, of most database management software. Similarly, the data box for each field can be adjusted in length at character resolution, not pixel resolution, making it much easier to line up field elements.

Text is handled in a similar fashion, and any amount can be entered then dragged to any position on the card.

However, text colour, typeface and size cannot be altered in any way. The object-oriented nature of the card layout window bears more than a


SEARCH CARDS FACILITY

passing resemblance to *Draw*. Indeed *Junior Database* has been designed to work along the same lines as *Draw* and to manipulate the software's graphical output with it.

Once the card is complete it can be saved, forming a template for all the cards in the proposed database. It is wise at this point to rescale the layout card window to the appropriate size, because this is also saved.

DATA EDITING

Clicking on the filename brings up the Data Editor and a blank card, attached to which is a 'tools box' (similar to *Draw*) containing the usual 'cassette recorder' style buttons, add card and delete card icons, search box and a slider scale representing the file.

Once data has been added to the fields on a card, it is automatically saved before a new blank card is added. Individual cards can be saved as text files or drawfiles and data can be saved as CSV or tab files for import into a wordprocessor or spreadsheet.

If the card layout is found wanting at this stage, the layout editor can be activated for immediate alteration and editing of the existing layout. When complete, the layout editor returns you directly to the current card in the data editor.

Other options available in the data editor are sorting, searching and graphs.

Clicking on Sort brings up a window containing a copy of the card layout with buttons for ascending and descending order and selection 1 and 2 for one or two field sorting.

Dates entered as a separate field (DD.MM.YY) provide the most useful format for sorting this type of data. The Search Card window has an Expression option for expressions like: field1>10 AND field2="William". A menu on any field gives a dialogue box with >, <, = and the range.

Wild cards can be used and the Boolean AND, OR, NOT. Other file formats can be imported for use in *Junior Database*, with *Key*, *Dataking Plus*, *Quest*, *Grass* and *Superstore* currently being supported.

From the data editor, the Graph dialogue box is accessed with options to draw pie and bar charts (including 3D versions), scatter and line graphs. Clicking on the x or y axes of the graph window provides a list of fields from which to choose, with automatic scaling of the graph and a choice of graph type, irrelevant graph-types being greyed out and unobtainable.

Graphs can be overlayed, rescaled, saved as a drawfile or sprites and data is output in CSV format. Printing is via Risc OS drivers, giving reproductions of coloured graphs or graphs in outline – an important feature for young children who prefer to colour in their bar charts themselves.

However, as the graphs can be dragged into *Draw*, each element in the graph can be edited as if it were a drawing.

Thus, what was a graph of plain single bars can become a 'stacked' bar chart simply by using the normal *Draw* features.

One feature of the software which sets it above the competition is its Setup dialogue box, permitting teacher control over every aspect. It allows any number of its features to be hidden which can result in a very simplified and limited version of the software compliant with the needs of a particular group of children.

So, if children have only experienced bar charts, the other graph types can be deselected so they will not appear at all. Control is also given over draggable and selectable fields in both the Data and Layout Editors. The Setup window can be password protected to keep little fingers from making any undesirable alterations.

One rather novel and interesting use which has come to light is the ability to produce a database of plots for a shape, like a child's hand. A hand shape is plotted first on graph paper, then its co-ordinates are entered into a database of X and Y plots, which can produce an interesting line drawing of the hand. This can be exported to *Draw* and manipulated and scaled in many ways.

Once this idea is understood by the children it is a small step for them to collect, say, leaf samples from a woodland area and by the same process develop plots of these, analysing their form and geometry via *Draw*.

CONCLUSION

Junior Database cannot be compared with *Datasweet*, the database manager of which is in fact three variants of the same program using keywords, sprite images and card index format respectively. *Junior Database* has much more in common with *Dataking Plus*, but with a number of additional features which do put it in a class of its own.

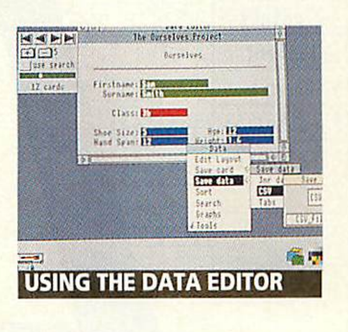
The ability to design and modify the card layout is a particularly good use of the Risc OS environment and the tutor system is an excellent way of making the unknown familiar.

In concept and design, *Junior Database*, with judicious use of the Setup dialogue box, is well suited to the needs and abilities of all primary aged children.

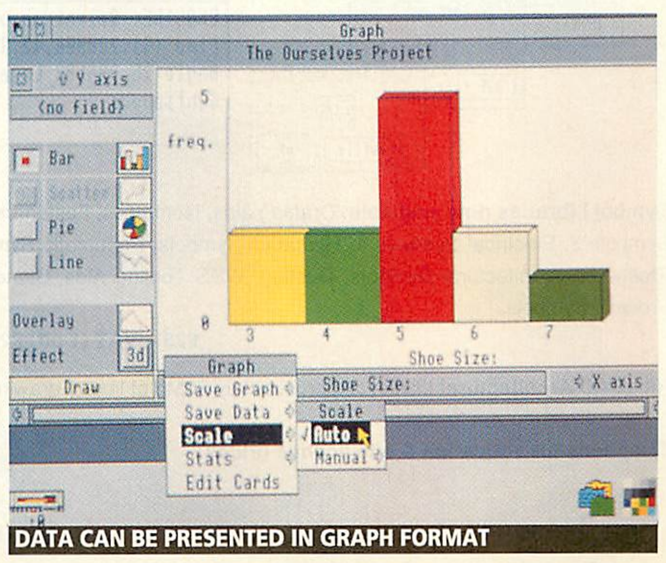
Being fully Risc OS compliant, a number of datafiles can be open at any one time, all operating in what is rapidly becoming a common educational software environment.

Certainly this software will dispel any doubts about the effectiveness of a Wimp environment for primary school children.

Junior Database for the BBC A3000/Archimedes costs £53 (school price £39 for single user, with site licences available). For further information contact Iota Software, St John's Innovation Centre, Cowley Road, Cambridge CB4 4WF. Tel: (0223) 421542.



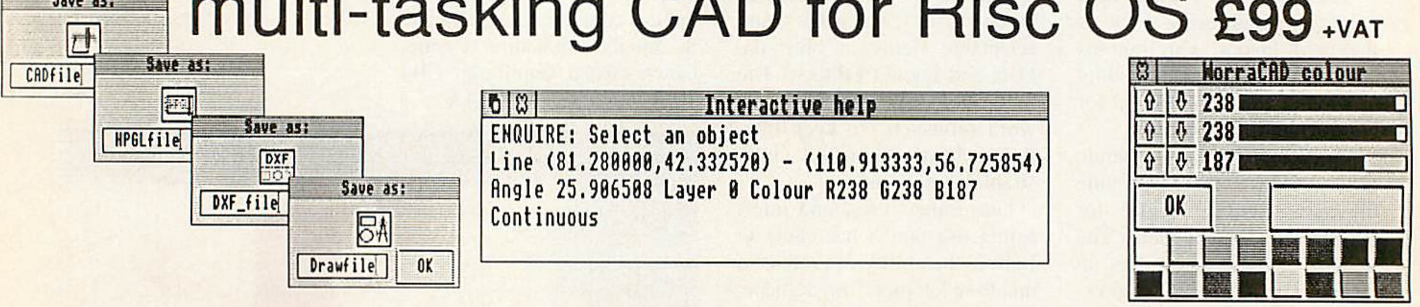
USING THE DATA EDITOR



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DIRECT DRIVE

GRAHAM BELL looks at CC's 600dpi laser

Computer Concepts released its original Laser Direct laser printer some months ago. Now the Qume-based LaserDirect is joined by two high resolution variants based around Canon laser mechanisms.

The first is the LaserDirect Hi-Res itself – a combination of controller podule and Canon LBP-8, an eight pages a minute laser printer that's used as the basis of other machines like the Hewlett Packard Laserjet and Apple Laserwriter. The second is the Hi-Res podule on its own, to which you add a Canon LBP-4. This is a smaller version of the LBP-8: and only rated at four pages a minute.

After using the Hi-Res for a couple of months, I find the improved quality of text is barely noticeable. It's in printing sprites and drawfiles where the difference really shows. And the most startling difference is in the quality of greys – because there are four times as many dots per square inch than with normal 300dpi printers, the half-tone spots (each made up of several printed dots) can be much smaller. Hi-Res printed sprites approach newspaper quality.

You can choose between 300 × 300, 300 × 600 and 600 × 600 dot per inch resolution through a dialogue box – it takes only a few seconds, but *Draw* crashes if you try to change the resolution while it is loaded. Other software is unaffected. At 300 dpi, the printing speed isn't noticeably different from the Qume-based LaserDirect. At 600dpi, there's four times as much data to deal with, so printing speeds are a bit less than four times slower. The amount of memory needed also quadruples – a full-page sprite can take up 3Mb or so – so you'll need a 4Mb machine. And for routine use of 600dpi resolution, you'll definitely want an Arm 3. On a 540 it's a dream.

Although the LBP-4 is nominally slower, the first page is printed only a second or so after the LBP-8. It's only on the second that it's noticeably tardy – and then only if it's a complex page on an Arm 2 machine.

From the buyer's perspective, the differences between the two models are quite fundamental. The LBP-8 model is based upon a cut-down version of Canon's 'departmental' laser printer. It's big, is eminently capable of several thousand pages a month. But it has an anonymous beige coloured, slightly cheap-looking plastic case, lacking the solid feel of a Hewlett Packard or Apple machine. The paper tray is small and Computer Concepts would be well-advised to get some stickers to spruce up the exterior.

The smaller LBP-4 is rather neat and stylish in comparison. The podule fits in the same way, and connects to the LBP-4's video input. But here's its advantage: it also has a normal parallel port, and can be used as a PC printer too (though it's not Laserjet-compatible – it has its own language). Because it's a standard LBP-4 you're paying a little extra for the electronics inside, but the printer's not tied exclusively to your Arc. LBP-4s can be bought relatively cheaply and it can work out £200 or so cheaper than the complete LBP-8 version. It's more flexible, and the print speed and pages per-month rating is not (for most people) critical. Most buyers should choose Hi-Res podule plus LBP-4. CC is on (0442) 63933.

600 DPI, HOW?

Laser printers print by scanning a laser beam across a light-sensitive drum, switching it on and off rapidly to put dots on the drum. The resolution is fixed by the speed of turning the laser on and off (how many dots across the paper), and by the speed the paper moves as the laser scans across it (how many lines down the paper).

The Hi-Res uses two techniques to boost the resolution. First, it switches the laser on and off much faster and more accurately, giving 600 dots across the paper. But it cannot speed the sweep of the laser up or slow the paper down to give more lines per inch.

The technique used is to vary the size of the dots by having the laser half-on, putting smaller dots on the paper. It's similar to Hewlett Packard's resolution enhancement fitted to the Laserjet 3.







300 DPI UPDATE

Calligraph has recently released a new version of the printer driver for its ArcLaser, below are the new features and times.

The first timing is when control of the computer is returned. CC scores here, for its card achieves background printing, –the computer is only tied up for the time it takes to assemble a page and control is returned while the data is being sent to the printer. With the Calligraph, control is only returned when the whole process of printing is complete. The second timing is when the last page of the document lands in the printer tray. The times in the Quicktext column are those printed with CC's replacment for the slower Acorn Font manager.

Calligraph's printer now has the option of trading off the number of grey shades against the quality of the half-toning: choosing only 16 greys (as against the normal 64) gives fine tints, comparable with the Laserdirect Hi-Res. CC's Low-Res printer can't do this. Calligraph also boasts full Epson compatibility (ie, you can print from Basic) , although by the time you read this CC should have released its version of Epson emulation along with version two of its printer drivers. Network printing is also a feature of the Calligraph, but this is only really viable for small networks as it is jammed up while the printer is operating. Network printing via CCs machine will be achieved with the network version of Showpage when available. Calligraph is on (0223) 461143.

	Calligraph	CC	Quicktext
Sprite printing	25.91s	9.49s	-
	34.04s	29.90s	-
Portrait document	60.15s	44.90s	30.08s
	68.40s	64.00s	54.98s
Landscape drawfile	22.06s	33.19s	14.30s
	29.52s	53.57s	34.25s
15 Page landscape	540s	1170s	489s
document	531s	1189s	507s
Plain text from	42.84s	31.00s	12.47s
the desktop	50.84s	51.31s	32.85s

Summary – CC Qume-based Laserdirect is generally a bit quicker, much quicker with Quicktext on, but slower if the text is landscape.

ON THE BOX



Teletext has always been popular with Acorn users. There are two adaptors available for the Arc, and **CONRAD FACHS** has been watching them work

Acorn computers and teletext have been linked together in various ways for a number of years now – in fact, one of the first peripherals available for the BBC B was Acorn's own teletext adaptor. Until quite recently, the BBC's teletext service, *Ceefax*, provided a page from which you could download programs (telesoftware).

There are two companies supplying teletext adaptors for connection to the Archimedes – Morley Electronics, which is well known in the BBC market, and the relatively unheard of Ground Control.

Both adaptors are separate units from the Archimedes, ie, they are not podules. They do, however, need to be plugged into a podule slot as they communicate with the Archimedes via its IIC data bus.

This so-called 'slow' data bus is essentially a synchronous serial connection and is used internally in the Archimedes to talk to the CMOS Ram and clock circuitry. It can be used to communicate with all sorts of electronic equipment – I have seen video recorders with an IIC socket hiding behind a panel on the back. The main advantage of using an IIC connection is that the equipment can be connected to a variety of machines with the minimum of fuss.



KEEP UP WITH THE NEWS...



...AND WATCH THE WEATHER

The Ground Control Unit has an internal power supply, a meaty on/off switch, two output connections (Data and Aux), an aerial socket and a BBC biege steel case about the size of a half height 5.25in disc drive, or Music 5000. The review unit came supplied with a very nice lead to connect to the podule slot (complete with a sealed podule connector). On the other hand, the Morley Unit has rather a fragile looking ribbon cable with the podule connector soldered onto the end. It also needs a separate main adaptor which is plugged into the podule connector, rather than the unit itself – which means another wire going into your Archimedes. This is okay if you don't move your machine a lot, but may annoy the more mobile Arc user.

SOFTWARE

It is not really fair to do a direct comparison of the supporting software, as they are totally different. Ground Control has written a fully multitasking Risc OS-compliant desktop application for which I have just received an upgrade to version 2.1. Morley, on the other hand, has a fairly basic, single tasking program with no real frills, but the company is promising a Risc OS version 'soon'. I have therefore run through the facilities of each separately with the minimum of comparisons.

Morley's software uses the Archimedes own mode 7 display and is therefore capable of displaying all the usual teletext alphanumeric and block graphics albeit in Acorn's rather unpleasant mode 7 emulated font. All control is via the keyboard, mainly with the function keys, although page numbers are entered with the 0-9 keys.

Up to eight channels are supported, each of which can be separately tuned with SHIFT-F5, which displays a readout of the channel number as a decimal and its frequency in MHz. The cursor keys can then be used to tune the channel, but this is rather a hit-and-miss affair as there is no sure fire way of knowing if you have the tuning exactly right.

I would have preferred either an automatic tuner, or some sort of signal strength/quality indicator.

The tuning information is stored in a file as there is no battery back up of the unit's tuner. Channels can be selected by pressing SHIFT-F1-F4 which takes you straight to the index page for that channel. Subsequent pages are accessed either by typing their numbers directly, or by using the coloured FasText links

displayed at the bottom of the screen via F1-F4 and F5 for index. Unfortunately, no FasText caching is performed (see separate box).

Pages can be saved, loaded and dumped to a printer (text only) and function keys are provided for page hold and reveal/conceal – but apart from this, the software is very spartan. The only real embellishment is the ability to enter a sub page number – eg, the TV pages are often over three or four pages long, but you can instruct the software to wait for, say, page two and not display the others as they are received.

This sounds useful, but I can't really think of a time when you'd want to use it.

The most notable difference between the two units is that the Ground Control software runs in a window on the desktop. This means that a complete mode 7 emulation had to be written, which has its pros and cons.

First, it means that the software truly multi-tasks in any mode and second, you don't have to look at the Arc's own awful Mode 7, since a completely new character set has been designed. A lot of effort has gone into designing this font and it is exceptionally easy to read.

Against? Well, you don't get flashing characters. The only 'feature' of this emulated mode 7 comes in the colours used. The standard set of colours available in the desktop does not really have a suitable cyan or magenta, so the software changes the palette to include these. This does mean that certain other graphics may look a little strange, but you can disable this feature. Ideally the ColourTrans module should have been used, but this method is acceptable.

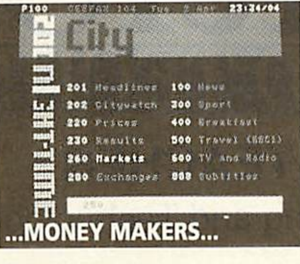
Tuning the unit involves bringing up the tune dialogue box from the main menu and either manually tuning with the left and right arrows or by clicking on the Search icon. This steps through channels 21-69, stopping when a teletext header is detected.

A fine tune control is also provided for manual tuning, however, the auto tune doesn't appear to make use of this facility, which means it can often miss signals.

The best way of tuning the unit is via the AUX output. This provides composite video, audio and ground connections and with the aid of a piece of wire and a suitable composite video monitor (eg, Philips CM8833) allows you to watch the telly on your monitor! More importantly, it means you can easily tell when you have correctly tuned the unit by the quality of the picture.

Channels are selected by clicking on the Ch button in the keypad window followed by a click on one of the numeric buttons. This is a little fiddly and I would have liked some form of separate channel selector. Pages can be reached in three ways: you can use the numbered keys in the keypad window (optionally prefixing them with the Pg key to clear any peding input), you can click on the coloured FasText links at the bottom of the window or most usefully, you can point to, and click on, any page number displayed in the window. This facility is really very useful and saves an awful lot of tedious button clicking.


FOR CHART TOPPERS...


...MONEY MAKERS...


...TELLY ADDICTS...


...AND TOURISTS

As with the Morley software, no FasText caching is performed.

The keypad window also contains buttons for Hold, Reveal and Last Page. This last feature fairly obviously takes you back to the last displayed page. It would have been nice if this had been a repeatable 'last page', taking you back a page at a time. As it is, it is of fairly limited use.

Likewise is the ability to set up preset pages on the menu, this allows four pages to be defined (ie, channel and page number) and named on the menu allowing you to jump straight to them.

An 'unlimited', nestable, system (like the PD desktop application *Menon*) would be far more useful. The idea is, however, very handy. Two other menu options allow screens to be printed and saved. Double-clicking on a saved screen reloads it into the window for later perusal.

Finally, if you look at Channel 4's test screens on page 693, you'll find that a number of foreign character sets have been built into the software. Unfortunately, the various facilities of Extended Level 1 and Level 2 teletext (such as double width and height, smooth graphics and palette changing) aren't supported.

CONCLUSION

To sum up then, if you hadn't already guessed, the Ground Control unit has considerably more facilities than Morley's and is by far the more attractive of the two units.

Quite honestly, it seems as if Morley have just knocked its together. If it was half the price of Ground Control's I could understand it, but double? It makes you wonder what it's up to.

Perhaps its promise of Risc OS software will even up the score, but even then it is going to have to think quite carefully about the price.

If you want a teletext adaptor for your Archimedes, I'd get onto Ground Control as soon as possible.

FASTEXT

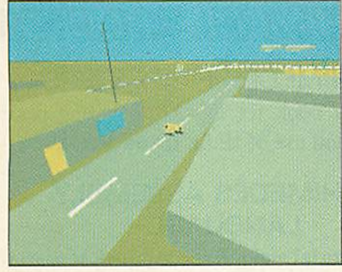
FasText is a recent addition to teletext that allows pages with related information to be accessed quickly and simply. Four coloured keywords are displayed at the bottom of most screens and pressing the relevant key on your TV remote control (or Archie keyboard!) will automatically enter that page's number and start searching for it. Many TVs will start searching for, and caching, the FasText link pages as soon as a page is displayed, this can then give the illusion of instant access to subsequent pages.

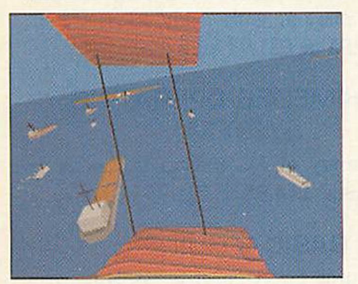
PRODUCT DETAILS

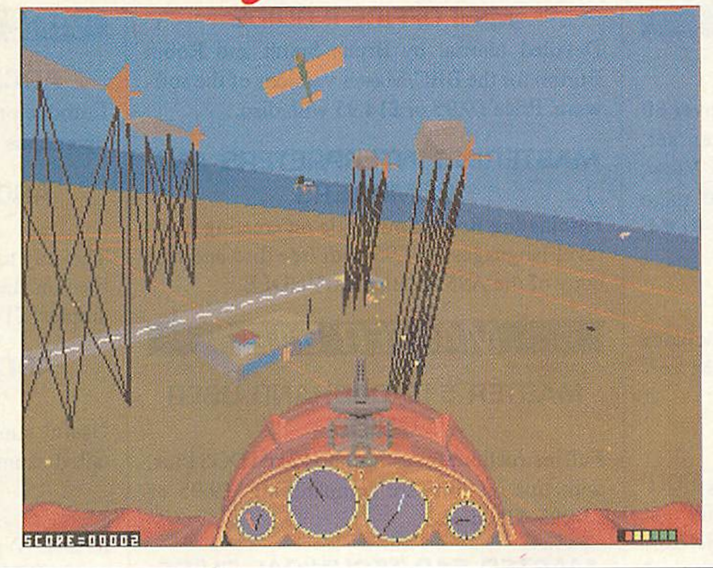
Morley Electronics' adaptor costs £147.20 and is available from Morley House, West Chirton, North Shields Tyne & Wear NE29 7TY. The Ground Control unit costs £75 from Ground Control, Alfreda Avenue, Hullbridge, Essex SS5 6LT.

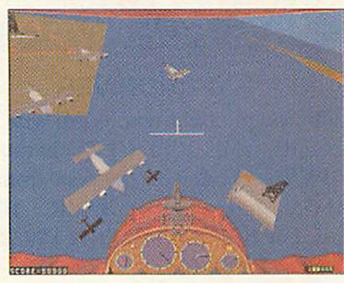
BBC A3000 / ARCHIMEDES / BBC A3000 / ARCHIMEDES / BBC A3000 / ARCHIMEDES

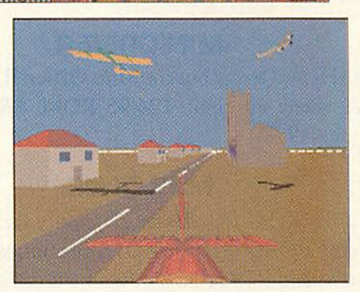
Chocks Away Extra Missions











CHOCKS AWAY

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- Easy to fly, yet highly manoeuvrable bi-plane - ideal for all ages/skill levels
- **Revolutionary 2 Player Option** using split screen display. This allows 2 players to each fly their own planes simultaneously in practice, dogfights, or missions
- Full joystick, dual joysticks, mouse and keyboard control options
- **Amazing "Black Box Flight Recorder"** included so that you can record your own flights and then save & replay them. 90 minutes of totally absorbing pre-recorded training flights are included with the game
- Internal/External views of your plane can be selected from front/rear/left/right
- Powerful 30mm canon capable of very rapid fire and long range destruction
- Easy to read instrument panel and simple controls
- 3 very varied immense maps to explore - approximately 18000km^2 in total
- 20 fascinating and varied missions of increasing complexity are included with a promotion system from Cadet right through to Marshal of the RAF
- Superb range of targets/enemies including bombers, triplanes, fighters, tanks, control towers, anti-aircraft guns, head quarters and patrol boats

Chocks Away Mark I Version was awarded **GAME OF THE YEAR 1990** by **Acorn User, A&B Computing (now Archimedes World), RISC User & Micronet**

"Graphics in the game are superb, smooth and with plenty of ground detail... this is a really enthralling flight simulator with plenty of variation and features to ensure longevity." **RISC User, Dec '90**

"Chocks Away is a delightful game." **Archive, Jan '91**

"Chocks Away is a brilliant game." **BBC Acorn User Dec '90**

"... It's a really great game, Playability 10. Value 10." **The Micro User, Jan '91**

"(**Chocks Away Mark II Version**)... The increased speed obviously makes the game more responsive and fun to play, well and truly overtaking Interdicter II as the best Archimedes plane game." **New Computer Express, Feb '91**

CHOCKS AWAY EXTRA MISSIONS

This consists of a new manual and a disc containing an additional 26 missions (6 of which are reconnaissance missions). It is loosely based on the original Chocks Away and features an extensive range of extra features and improvements. To run it, you will require the MkII version of the original Chocks Away. Extra features include:

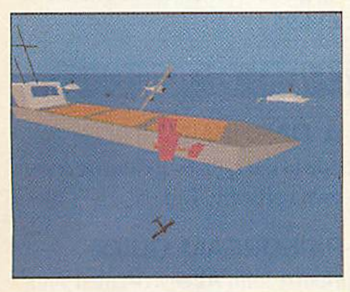
- 16 new & detailed maps based over land and sea.
- 20 enemy planes and 20 enemy targets are included in each mission. Over 1000 extra targets and planes have been carefully defined.
- Considerably improved action on all missions with plenty of targets to shoot at and plenty shooting at you.
- You can view the action from any of the enemy planes or targets and your own control tower at any time even while still controlling your own plane or watching a saved flight. There is a selection of tracking cameras (with adjustable zoom lenses!) around the playing arena. In addition a phantom plane can also be selected to follow the action on any or your black box flight recordings.
- Improved enemy pilots capable of performing loops, rolls, stall turns etc. All enemy planes are carefully modelled using the same equations controlling your own plane. This ensures both an accurate and fair simulation.
- More enemy planes and targets to shoot including: Three Engine Fighters, Enormous Cargo Planes, Airships, Barrage Balloons, Gun Boats, Oil Tankers, Trains etc.
- Six reconnaissance missions where you are required to take photos of various installations with your new on board camera.
- Improved graphics over the 16 maps including Complex Cities, Houses, Railways, Roads, Rivers, Bridges, Lampposts, Railway Stations, Oil rigs, Piers, Beaches, etc. to mention but a few. In total over 100 different graphics have been defined.
- Serial Port Link Up option so that you can link up 2 BBC A3000 or Archimedes computers and 2 pilots can fly simultaneously in full screen mode.
- Extensive enemy flak guns and improved enemy plane guns help make the new missions both more interesting and challenging to say the least!
- Improved digitised sound effects plus, of course, all the extensive options which are available with the original Chocks Away.

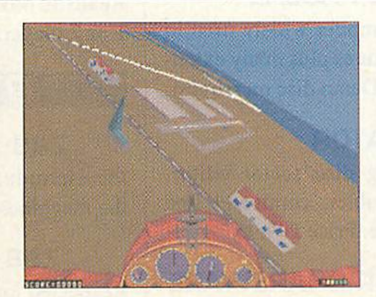
WIN a superb......

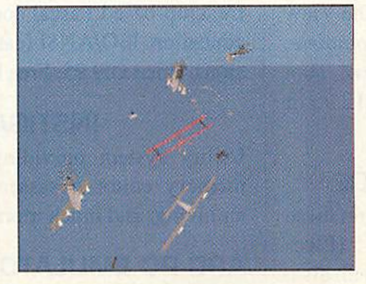
"Radio-Controlled Biplane"

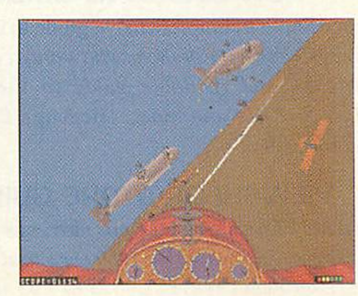
Successful completion of all 6 Reconnaissance missions will allow you to enter this competition

TALLY HO GINGER!









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CODER : FYB
GFX : Sylvio PORRETA
SOUND : FRD



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GFX : SAURE
SOUND : FRD



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Inky and Jinky were just having fun when the first bubble came down from the sky ...

This game features 72 levels, challenges, bonus and a special noughts and crosses game .

It uses a big overscan screen (384 x 264) with 256 colors .

AVAILABLE JUNE 91

CODER : Philippe Aubessard, Laurent ROUSSEL
GFX : Stéphane ANQUETIL
MUSIC & SOUND : J. AMBROSSE

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If other micros had the power of the Archimedes, they would have this game ...

What the press says :

" It's a game of top quality ... Buy this game, you won't be disapointed " 11/90, BBC Acorn User .

" Ballarena is polished and professionnal as well as beautifully put together ... " Graphics : 10 - Sound : 10 - Playability : 9 - Value for money : 10 - Overall : 9 - The micro user 3/91 .

CODER : FYB
GFX : FRK
SDX : FRD



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Graphics :9-Sound :8-Playability :9-Value for money:10-Overall:9-The micro user 3/91.

CODER : FRD
GFX : FRK - SDX : FRD

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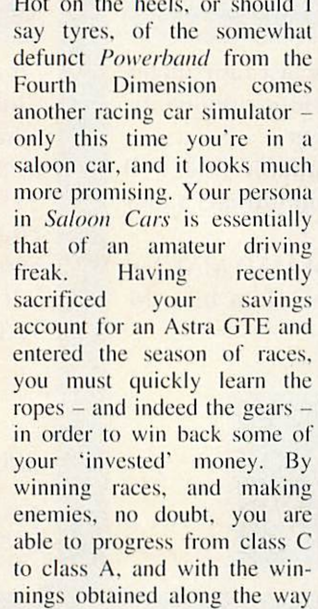


DESIGN COPYCENTER



GAME SHOW

CHOCKS AWAY CAN NOW BE PLAYED BY UP TO FOUR PEOPLE



Hot on the heels, or should I say tyres, of the somewhat defunct *Powerband* from the Fourth Dimension comes another racing car simulator – only this time you're in a saloon car, and it looks much more promising. Your persona in *Saloon Cars* is essentially that of an amateur driving freak. Having recently sacrificed your savings account for an Astra GTE and entered the season of races, you must quickly learn the ropes – and indeed the gears – in order to win back some of your 'invested' money. By winning races, and making enemies, no doubt, you are able to progress from class C to class A, and with the winnings obtained along the way upgrade your saloon to a nice smooth BMW M3.

According to 4D, the mathematical dynamics of the car is all classical Newtonian stuff, and the game is being written by a professor of physics at Manchester University.

Apparently this guy is dead keen on the concept of accuracy and has personally taken his own detailed measurements at Silverstone and Brands Hatch to incorporate in the game. He now wants 4D to send him to Australia and places to obtain similar data from other famous tracks! So, look forward to Brands Hatch, Silverstone and the M25!

An exciting prospect regarding the game is the fact that a serial link-up mechanism will be included as standard. This means that if you can arrange two computers relatively close to one another, two players will be able to race the same track in separate cars! And as with the *Chocks Away* mark 4 disc, a second version of *Saloon Cars* will provide Econet routines to allow up to four players to race simultaneously. *Saloon Cars* is set for launch in early June.

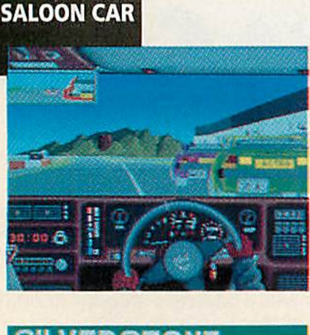
If you have access to an Amiga computer, or are at all plugged into the Amiga world of games, then you can't have missed a fairly recent game called *Lemmings* which has been, to put it mildly, popular. The broad objective in *Lemmings* is to guide a group of about 100 rather indifferent lemmings through various scenarios, the basic idea being to avert individual disasters and emerge with as many of the small furry rodents alive as possible. The lemmings are oblivious to the dangers around them, and a loose trapdoor, for example, can spell trouble for as many that can launch themselves through the hole before you get a chance to close it! You get the idea.

The game is due to hit the streets early June and is being produced by Psygnosis, renowned among 16-bit users for a highly popular game called *Shadow of the Beast* a few years ago. Psygnosis' ginger step into the Archimedes market is interesting to say the least. Though the company says it has no further plans regarding the machine, I hope significant sales of *Lemmings* will offer a change of mind. In any case it's good to see efforts in the 16-bit arena reaching the Archimedes. Perhaps other big software houses will now recognise the Arc market as viable for appropriate conversions. Domark has already shown a willingness in this respect with the launch of *MiG-29 Fulcrum* on the Arc, and Virgin is demonstrating commitment with *Wonderland* (see reviews of both below). Perhaps this Christmas will see a dramatic upturn on the 32-bit games scene....

Excellent news for fans of the *Manchester United FC* game. Tony Patterson of Cheltenham has sent in a listing which creates a special module to allow two players to use the keyboard in two-player mode. The listing can be found in the yellow pages and on the monthly disc. Tony earns £25 for his trouble, as did Jonathan Hart, the author of the *Exile* Editor in April's issue. Type in the listing and run it. The program will create a module called JoyMod and save it to disc. Then it will perform a short test routine and by pushing the buttons shown under *Help Joy you can check it all



EXPERIENCE SILVERSTONE IN YOUR SALOON CAR





works. To use the module in the game simply make sure you double-click on the Joy-Mod file before loading.

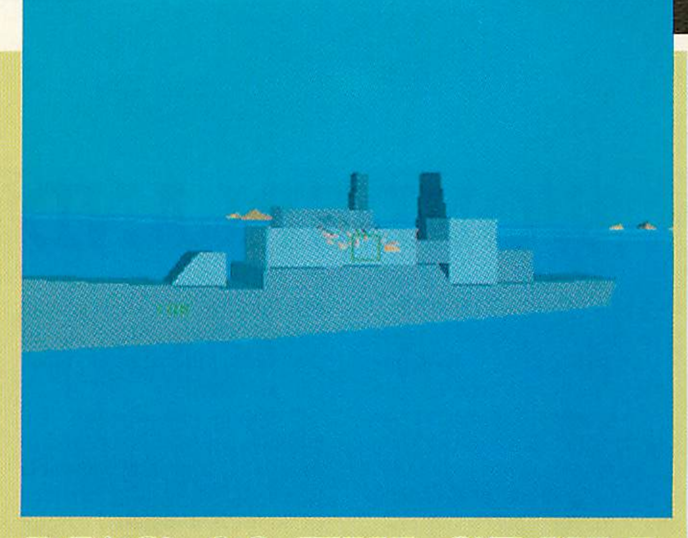
Once MUFC is up and running double-click on the disc icon, then on the football-and-question mark icon. Then click on 'Define keys for joystick' and press M to enable the module, followed by D, F8, F9, F10, F11 and F12 to prevent the normal keyboard controls interfering with the module. Now press E, click on Exit then on the double folders icon to return to the main options screen. This should all be saved on the team disc if you have one. Now play the game as normal and use the keys described in *Help Joy, which you should of course have noted down before loading MUFC! Have fun, and thanks to Tony.

The person who sends me the most convincing reason for desperately requiring the MUFC module will receive a copy of the monthly disc containing the module.

And lastly, a small extension to the *Exile* Editor competition from the April issue. The first person to write in with both the correct answer to the question in April AND the name of the person from Newcastle who sent in the correct answer but forgot to include their name or address, wins the monthly disc! The closing date for both is June 5th 1991.

Sam Greenhill

FLY HIGH WITH THIS EXCELLENT AIR FIGHTER SIMULATION



MiG-29 FULCRUM

Domark. Tel: 081-780 2224
Archimedes £39.95.

Fire up the afterburners, release the wheel brakes and gradually pull back on the 'stick'. The MiG-29 slowly gathers speed and as it thunders down the runway use the rudders to aim for the control tower, situated about half way down. If you then hang a hard right turn as soon as the MiG is airborne and fly directly past the tower with a tower's eye view of the plane, you will be impressed. The 'camera' viewpoint swings round as you pass and you see yourself fly off into the distance. In a sense, this illustrates one of the main differences between *Mig-29* and *Interdictor* – the wide variety of viewpoints. The outside view of the aircraft is very striking and useful too. Alternatively, lock onto an enemy plane and select the world as seen through the enemy's eyes! Then fire a heat-seeking missile at the enemy and choose its view of the operation – it's just like the many hundreds of instances in which we were shown allied air attack videos during the Gulf War. In fact the final mission is called, quite coincidentally, Operation 'Desert Strike'. Of course the only snag with all these views is that you still have to fly your own craft, even if you can't see it!

MiG-29 IS TREMENDOUS FUN AND HIGHLY RECOMMENDED

In *MiG-29* there are several missions, and these are satisfactorily assorted. The first involves 'photographing' the serial number on the side of an American submarine stuck in ice somewhere in the Arctic. This is easy until you realise there is barely enough fuel with which to return to base.

The second mission is based on the Chinese border and concentrates on dog-fighting with Shenyang fighters who have illegally crossed the border, the border being – I think – the Great Wall of China, though it's hard to be sure! This is difficult and I still haven't managed to finish it because the computer keeps building new planes each time I shoot one down. The next mission involves destroying oil platforms in the Persian Gulf (!), and despite the odd feeling that the Egyptians didn't really build pyramids there, this is very good fun. After that a night mission must be flown and lastly 'The Final Mission', which has some nice graphics.



One of the best features of *MiG-29* is the air-to-air and air-to-surface missile systems fitted to your plane. To activate them, you 'lock-on' to a target and the computer follows the target around the screen, until you're ready to fire. Enemy fighters are actually quite intelligent when threatened with a missile lock and often manage to shake you, making a refreshing change from *Interdictor 2*.

The sound effects have been badly implemented. Apart from the fact that the Russian MiG sounds distinctly like the Interdictor plane, it sounds as though your parachute (used at times of unintentional descent) has a pair of afterburners fitted as standard! The MiG's engine noise even gets into the briefing room! You can't get away from it.

A major oversight is the lack of any save game facility. On the final mission you are placed back on the first runway every time you are shot down, which is fairly often towards the end, and this is very annoying. The only details which seem to warrant permanent storage to disc are my pilot name 'Samski' and my score. Not very useful.

The overall verdict is tricky. There is no doubt that *MiG-29* is much better than the *Interdictors* because of the variety offered within the game, however the ommission of save game is a serious fault which places a firm limit on the game's life. Looking back, *Interdictor 2* seems very primitive now, and *MiG-29* is definitely what that game should have been. If you've got any money, I can recommend *MiG-29*. I've had tremendous fun playing it, but I don't know how long I'll be able to tolerate the save problem. Apart from this, it's great.

Sam Greenhill



WONDERLAND

Virgin. Tel: 071-727 8070.
Archimedes £34.95.

After nearly a year of waiting, Magnetic Scroll's new adventure is now available for the Archimedes and A3000. There were times when it looked like this might have been one of the 'much promised but never delivered' projects, common to the Archimedes. Fortunately, Virgin has done the right thing and delivered the goods.

Based on Lewis Carroll's book, *Alice in Wonderland*, *Wonderland* puts you in the shoes of Alice. Following the White Rabbit into his hole, you must travel around the fabled land, meeting characters such as the Mad Hatter and March Hare, whilst avoiding those like the rather unpleasant Duchess and Cook.

Coming on four discs, *Wonderland* is a truly massive game. Unless you've got about 2.5Mb free on a hard disc, you'll have to put up with a certain amount of disc swapping.

As well as the discs, you get the usual collection of Magnetic Scrolls goodies. A 72-page manual explains the use of the game and offers a few hints for those who get stuck; an on-line help facility is also supported. A separate A3 map gives a bird's eye view of *Wonderland* and shows all the major places to visit.

If you are familiar with past Magnetic Scrolls' games, you'll probably be wondering how they could improve on what was commonly regarded as the best adventure game screen layout around. Magnetic Windows is the new 'operating system', specifically designed for adventures.

As its name suggests, Magnetic Windows is a complete window environment, similar to the Archimedes' own desktop. Running in mode 12, the screen layout looks remarkably like that of an Apple Macintosh. The background 'grey' is even made up of dithered (alternating) black and white pixels.

Location descriptions and graphics are both displayed in their own scaleable, moveable windows. Movement between locations is now just a case of calling up the compass window and clicking on the required direction.

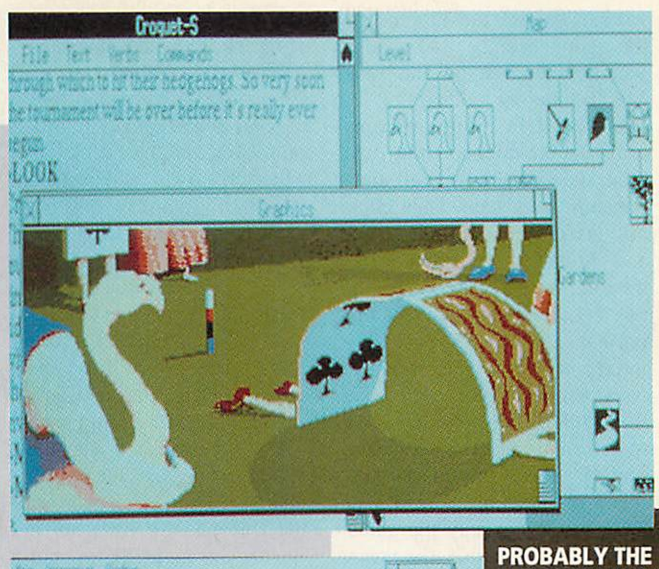
If all that scribbling of maps on scraps of paper has put you off adventures before, then *Wonderland* is for you. Just call up the map window and 'hey presto', all the mapping has been done for you. Each location is depicted as a small 'meaningful' icon, which can be moved to simply by clicking on it.

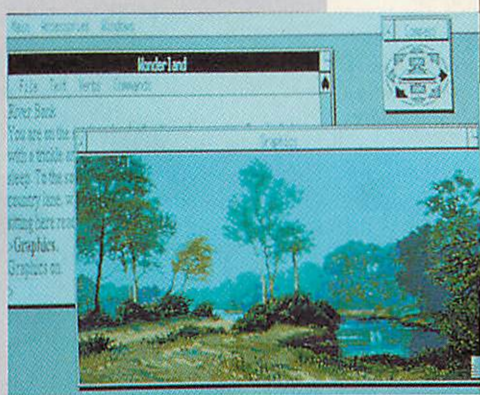
All objects, including those you are carrying, are displayed in windows as icons. Clicking on an object allows you to perform any one of a number of actions. Verbs that are irrelevant to the chosen object are automatically de-selected, making sure that you don't try to 'Open hedgehog' or 'Eat coat hanger'. Picking up an object is simply a case of dragging an icon from the location window to your inventory window.

A main window keeps a track of all actions, ie, dragging a coat hanger from the location window to your inventory window results in the line 'Get coat hanger' appearing. Commands can also be typed directly in this window in the traditional manner.

Unlike past Magnetic Scrolls' adventures, every location has its own picture. What's better, is that a number of them are animated. The standard of artwork is excellent, especially the hookah-smoking caterpillar and the sneezing cook.

The animation is brilliant: very smooth and detailed. It's difficult to appreciate this from stationary pictures in a magazine and I would suggest you try to get a demo off your local Acorn dealer if possible.





PROBABLY THE BEST STRATEGY GAME EVER

Sound is mentioned in the manual, although it's not supported on the Arc. A rather strange omission.

Puzzles throughout the game are of the usual high (and particularly hard) standard as expected from Magnetic Scrolls. There are lots of keys to collect, allowing for lots of locked doors. Once you've figured how to get into *Wonderland* itself, movement is relatively easy.

A lot of magic is involved and it's worth experimenting with any edible items when you have a clear head (or at least a bit of headroom). One should also keep cool when trying to get into the garden.

After playing *Wonderland* solidly for three days, I would certainly rate it as one of, if not the, best strategy games I've ever played. If you have an Arc and enjoy adventures, go and buy it.

Rob Miller

Archimedes Software

E & OE

DTP/WP

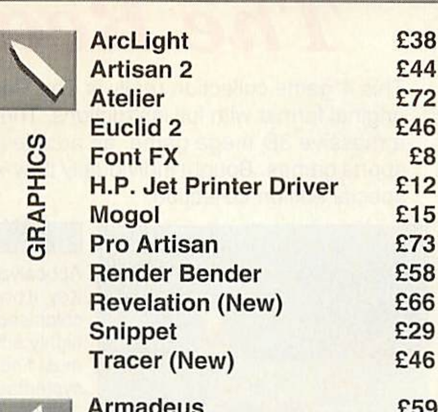
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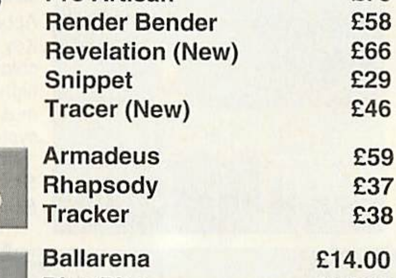
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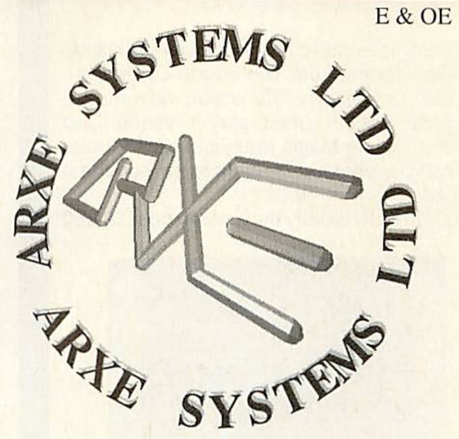


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The Fourth Dimension

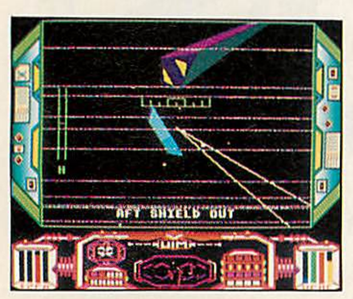
4 Game Collection

The Fourth Dimension

The Real McCoy

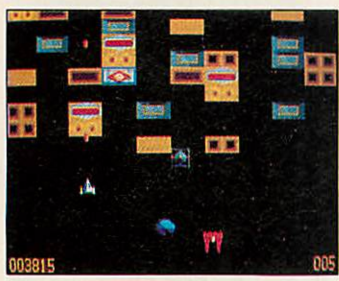
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Bought individually they would cost £81.80



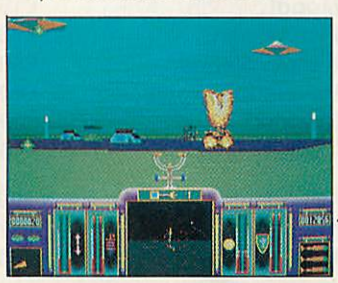






The Real McCoy 2

This 4 game collection really is The Real McCoy. These are genuine top games in their original format with full instructions. The games have been carefully selected and include a massive 3D mega game, an arcade isometric game and 2 quite different multi-player sports games. Bought individually they would cost £89.80p making this a very prestigious special edition collection.



APOCALYPSE (R.R.P. £29.95)

Apocalypse was written especially for the Archimedes by Gordon Key. It places you on the surfaces of varied futuristic hostile planets colonised by very varied but always ruthless enemies. In your highly advanced and extremely fast and manoeuvrable craft you must find your way around the increasingly massive planets and systematically annihilate the enemy.

"Simply, this is the best release yet for the Arc by absolutely miles. Stunning graphics, stunning sound and masses of action. Brilliant."....Risc User

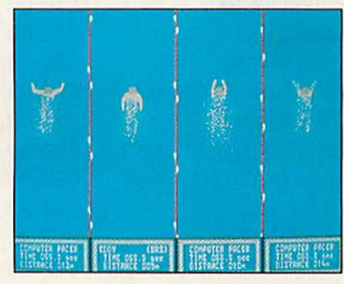
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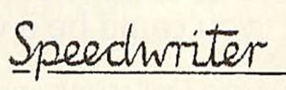
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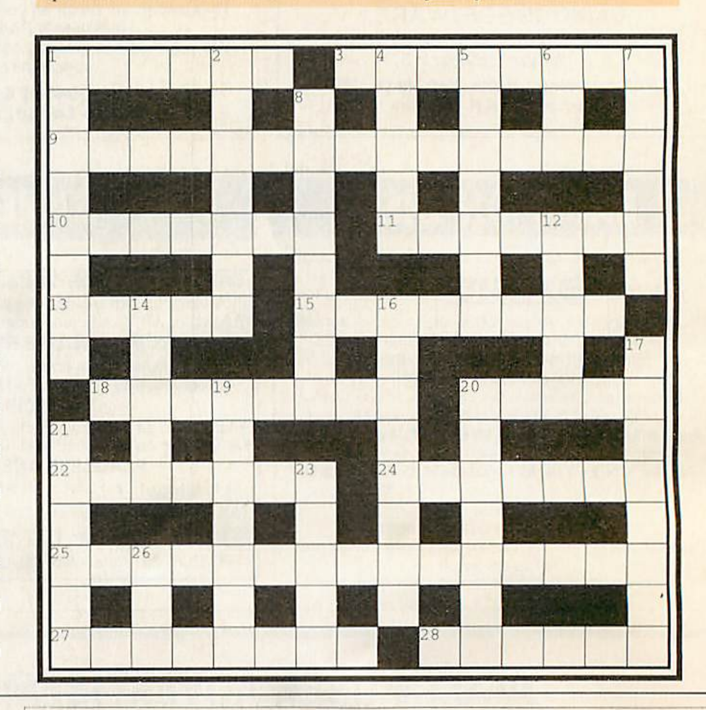
BBC Acorn User cryptic crossword, June 1991

Across

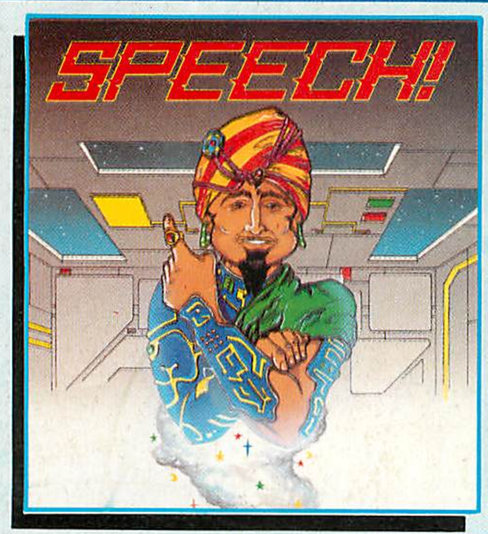
1 Sounds like a breakfast communication. (6)
3 Totalled badly, but still shared out. (8)
9 Operations carried out by the Atomic Spill Unit. (15)
10 Balance the railway collection. (7)
11 Percusive characters maybe? (7)
13 Sound of one in the nose! (5)
15 Machines completed by the Army but Acorn User started them with a broken atom. (8)
18 Taboo nun broke by utterance. (8)
20 Octopus, say, becomes a father around the end of July. (5)
22 Act for each appearance. (7)
24 Unreliable? Sounds like something wrong with 26! (7)
25 Could be claimed that line was severed. (9,6)
27 Burden with endless encyclopaedia tinged with brown. (8)
28 Data flow from dodgy Master? (6)

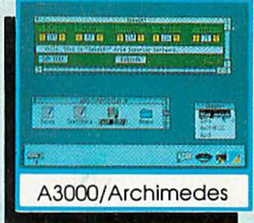
Down

1 Samuel! (Just testing) (8)
2 Give life to a mad prisoner. (7)
4 Hair left on chopping blocks. (5)
5 Go back mum, it pours perfectly! (7)
6 Number found in East Worthing. (3)
7 Stop! This street starts on the wrong side! (6)
8 Yalp! (8)
12 A lot, about 100. More like 8! (5)
14 Central part of a pub closed by the Queen. (5)
16 Diversions caused by touching circle. (8)
17 Computer made from mashed crumpets? (8)
19 Instruct computer for part of frog race held in afternoon. (7)
20 Ideal number? (7)
21 Graphic image of crazy priest. (6)
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26 Muscle spasm found in cybernetics. (3)



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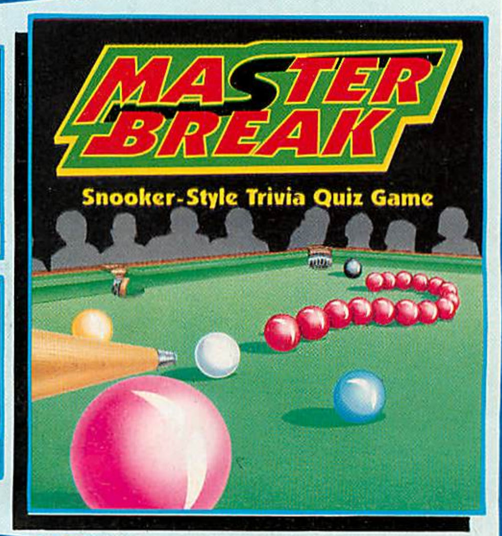
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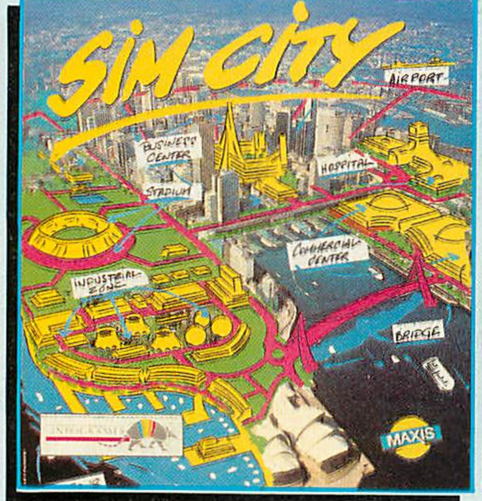
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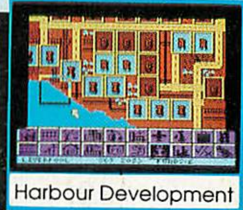
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OUR GUARANTEE

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- Postage and packing is free
- Cassettes and discs that are faulty on receipt will be replaced immediately

(This does not affect your statutory rights)